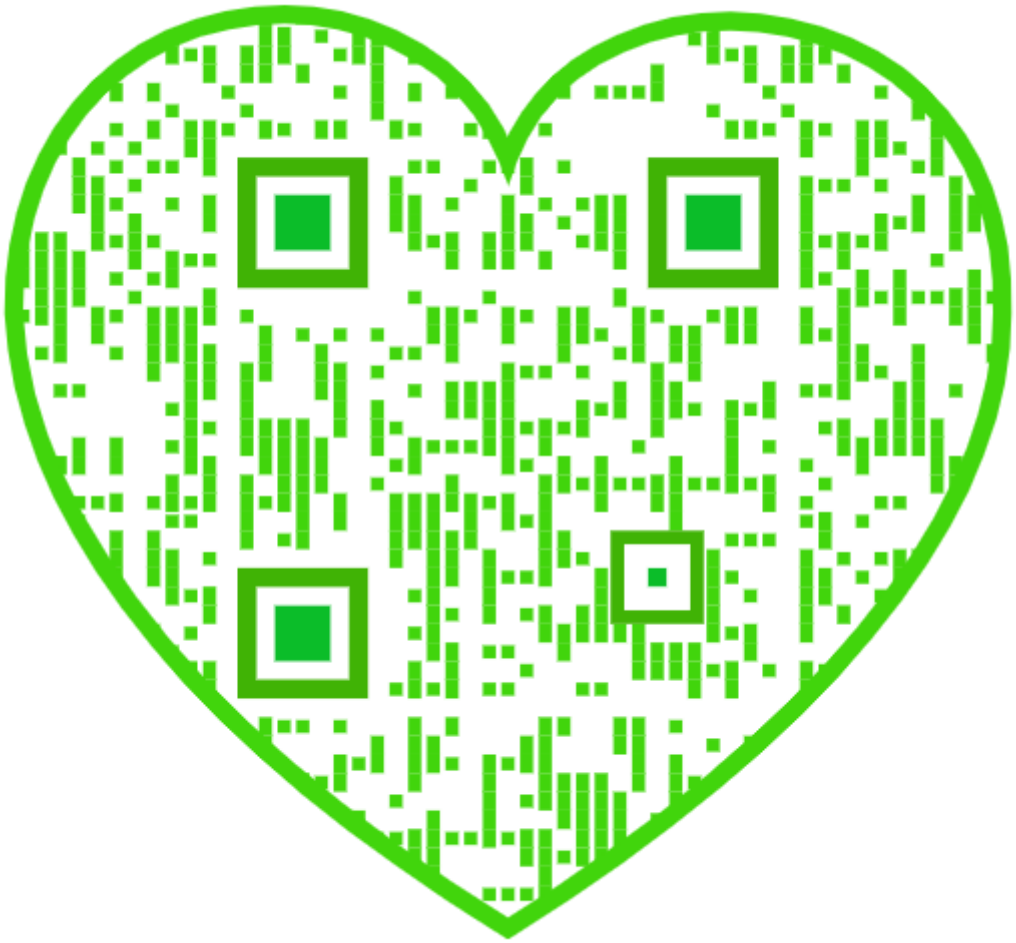


ELEMENTARY ARITHMETIC

BY

BRUCE M. WATSON

SUPERINTENDENT OF SCHOOLS, SPOKANE, WASHINGTON

AND

CHARLES E. WHITE

PRINCIPAL OF FRANKLIN SCHOOL, SYRACUSE, NEW YORK

D. C. HEATH & COMPANY, PUBLISHERS

BOSTON NEW YORK CHICAGO

615136
C

COPYRIGHT, 1911,
BY D. C. HEATH & CO.

INTRODUCTION

In the preparation of this series of arithmetics the aims have been:

First — To secure a high degree of facility in the fundamental operations and in those other processes which, in the actual business of life, are reduced to purely mechanical forms of computation.

Second — To cultivate in pupils the habit of forming vivid mental pictures of the business transactions introduced in the exercises, and of the commercial and industrial relations of the numbers involved in the problems.

Third — To make a clear and rational development of the theory of numbers as far as is necessary for intelligent arithmetical work.

Fourth — To grade the work up, from the simple and easy to the more complex and difficult, by steps so gradual and in an order so logical, that the pupil will steadily grow in mathematical power and take pleasure in his own progress.

In pursuance of the aims herein outlined, care has been taken to dwell upon each new process until the child has acquired a considerable degree of skill in it. Then it has not been permitted to drop out of sight and memory, but has been kept fresh by continuous and systematic review.

The problems of play, of trade, and of industry deal with things and transactions that are within the experience or knowledge of the child and appeal to his interest.

The numbers used in problems are not so large as to cause fatigue, discouragement, or waste of time.

In the development work, pupils are directed in a line of observation or experiment and enabled to obtain their facts from the numbers and objects studied, rather than from a printed statement.

The present volume is intended to cover the work usually accomplished during the first five years of school.

The text-book may be introduced either in the middle of the second year, or at the beginning of the third. When the former plan is chosen, the first thirty-one pages, consisting of oral work involving all combinations of numbers to twenty-four, will be found to contain sufficient book work for the remainder of the second year. When the latter plan is followed, the pages covering work that has been accomplished orally in the second year will serve as review and preparation for the lessons that follow. Development lessons are given on pages 5, 9, 15, 17, 18, 20, and 22, to serve as models for presentation of unit ideas. The other exercises contained in the first thirty-one pages are intended for review and practice, the number facts having been taught orally by the teacher.

The further distribution of the course through the third, fourth, and fifth years must be determined by local conditions, experience, and age of pupils. A proper division of the work in most schools will be to take Part II in the third year, Part III in the fourth, and Part IV in the fifth.

CONTENTS

PART I

	PAGE		PAGE
Counting	1	Gallon	18
Reading and Writing Numbers	2	Two, Three, and Four	19
Combinations to 12	4	One Fourth	20
Combinations of Two	10	Five	21
Counting by 2's	13	Foot and Inch	22
Problems	14	Six, Seven, Eight	23
Yard and Foot	15	Combinations to 24	24
Three	16	Drill Tables	30
One Third	17		

PART II

Reading and Writing Numbers	32	Multiplication and Division	80
Addition	33	Review	81
Problems in Addition	43	Time	83
Subtraction	46	Reading and Writing Large Numbers	84
Oral and Written Addition and Subtraction	47	Oral Practice in Numbers	85
Problems in Temperature	54	Written Practice in Numbers	87
Review	56	Review	88
Multiplication and Division	59	Multiplication	89
Review of Addition and Subtraction	63	Quick Tests for Review	91
Roman Numerals	64	Days and Months	92
Multiplication and Division	65	Finding Any Part of a Number	93
Review of Addition, Subtraction, Multiplication, and Division	66	Miscellaneous Problems	94
Multiplication and Division	68	Quick Tests	95
Quart, Peck, and Bushel	72	Review	97
Review	73	Miscellaneous Examples	98
Division and Multiplication	75	Multiplication and Division	100
Review	79	Review	101
		Avoirdupois Weight	103
		Review	104

PART III

	PAGE		PAGE
Multiplication and Division	105	Review	155
Quick Test	107	Problems for Review and Practice	156
Review	108	Adding Fifths and Halves	157
Multiplication and Division	109	Adding Fourths and Fifths	159
Making Questions	110	Adding Thirds and Fifths	161
Review	111	Adding Fourths and Thirds	163
Rectangles	112	Adding Halves and Sevenths	165
Multiplication and Division	114	Problems in Changing to Lowest Terms	168
Making Change	116	Table of United States Money	175
Roman Numerals	116	Problems for Review and Practice	176
Miscellaneous Problems	117	Table of Liquid Measure	179
Reading and Writing Numbers	122	Problems for Review and Practice	180
Review	123	Table of Dry Measure	181
Multiplication and Division	124	Problems for Review and Practice	182
Area	127	Table of Time	183
Division	128	Time Problems	184
Review	129	Division	186
Odd and Even Numbers	137	Table of Avoirdupois Weight	187
Factors	138	Table of Linear Measure	188
Quick Test	139	Review and Practice	190
Factors	140	Quick Test	191
Multiples	141	Surface Measure	192
Halves, Fourths, and Eighths	142	Table of Surface Measure	193
Miscellaneous Problems	143	Review and Practice	197
Review	144		
Perimeter	145		
Fractions	146		
Addition of Fractions	148		
Whole and Mixed Numbers	149		

PART IV

Notation and Numeration	202	Review and Extension of Subtraction	208
Arabic Notation	203	General Review	210
Reading Numbers	204	Review and Extension of Multiplication	213
Review and Extension of Addition	205		

PAGE

Review and Extension of Division 215
Review and Practice . . . 218
Indicated Work requiring Several Operations . . . 223
Special Cases in Multiplication and Division 225
Ideas of Proportion . . . 227
Factors and Multiples . . 229
Prime and Composite Numbers 230
Cancellation 232
Review and Practice . . . 235
Least Common Multiple . . 237
Greatest Common Divisor . . 238
Review of Integers . . . 240
Fractions 243
Reduction of Fractions . . 243
Reduction to Lowest Terms . 244
Reduction of Improper Fractions 245
Reduction of Integers to Fractions 247
Least Common Denominator . 248
Review and Practice . . . 250
Addition of Fractions and Mixed Numbers 253
Subtraction of Fractions and Mixed Numbers . . . 255
Addition and Subtraction of Fractions 257
Multiplication and Division Combined 259

PAGE

Multiplication of Fractions . 260
Review and Practice . . . 264
Division of Fractions . . 265
Examples for Practice . . 268
Averages 269
Ideas of Proportion . . . 271
Review and Practice . . . 272
Aliquot Parts 276
Decimals 278
Reading and Writing Numbers 281
Writing Decimals . . . 282
Addition and Subtraction of Decimals 283
Multiplying and Dividing by Multiples of Ten . . . 285
Multiplication of Decimals . 287
Division of Decimals . . . 288
Changing Decimals to Common Fractions 291
Reduction of Common Fractions to Decimals 292
Accounts and Bills . . . 295
Forms of Bills 296
Review and Practice . . . 298
The Multiplication Table . . 307
Tables — Liquid Measure; Dry Measure; United States Money; Avoirdupois Weight; Linear Measure; Time; Square Measure 308

ELEMENTARY ARITHMETIC

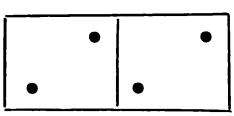
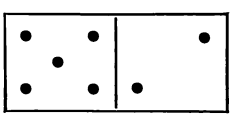
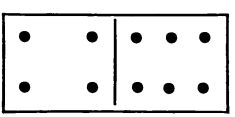
PART I

COUNTING

1. Count to twenty.
2. How many boys are there in your class?
3. Count the children in the class.
4. How many desks are there in your row?
5. Find twelve pieces of chalk.
6. Find eleven sticks.
7. Lay four sticks so as to make a square.
8. Lay four sticks so as to make a chair.
9. Lay eight sticks so as to make two squares.
10. How many squares can you make with twelve sticks?

NOTE. — These exercises are suggestive of many that may be given.

11. Write the figures for one, two, three, four, five, six, seven, eight, nine.
12. Tell as quickly as you can the number of spots on each of these dominoes:

1. Take ten sticks. Tie them in a bundle, thus,

2. Count out ten such bundles, and call each bundle "a ten."

3. Put one bundle on the table.

4. Put one stick beside it, thus, 1 1

How many sticks are there?

5. Put another stick with it, thus,

How many sticks are there? 1 2

6. Take another ten and put three with it, thus,

How many are there? 1 3

Go on in this way to nineteen.

7. What does the figure 1 stand for in the number 12?

8. What does the figure 1 stand for? in 13, 14, 15, 16, 17, 18, 19?

9. How many tens are there in 11? How many over? In 14, 15, 16, 17, 18, 19?

10. In writing ten we use the figure **1** for the ten bundle and **0** to show that there is none over, thus,

10

11. Take two tens. How many sticks in all?

12. To write twenty, we use **2** to stand for 2 *tens* and **0** to show that there is *none* over, thus,

20

13. Take two tens and one, thus,

How many? Write it, thus, 2 1

14. Lay counters for 22, 23, 25, 27, 29.

15. Lay counters for thirty, thirty-one, forty-three.

1. Write fifteen; twenty; eighteen; fourteen.

2. Write twenty-five; thirty-seven; forty; ninety-six.

3. Write eighty-two; seventy; forty-nine; sixty-one.

4. Write the number of desks in your room.

5. Write the number of stars on our flag.

6. Write your own age.

7. Count fifty, forward and backward.

8. Write in words 16, 19, 20, 43, 69, 38, 42, 71.

9. Write the number of books on the teacher's desk.

10. Write the number of panes of glass in your schoolroom.

11. Read 25, 21, 38, 45, 36, 28, 72, 64.

Write them in a column so that the *tens* will be in a vertical line.

12. Count forward and backward from 50 to 100.

13. Write in figures all the numbers to one hundred that have 0's in them.

14. Write in figures and in words the number of desks in your row.

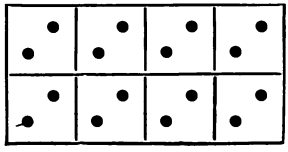
15. Write in figures and in words the number of letters in your name.

16. Read 15, 37, 58, 34, 96, 82, 67, 77, 17, 83, 39, 51.

17. Write in figures, ninety-one, twenty-seven, sixty-eight, ninety-three, thirty-five, fifty-three.

18. Write the number of squares in this drawing.

19. Write the number of dots.



1. There are how many drums in this picture?

2. One is a bass drum. How many other drums are there? How many fifes are there?

3. How many more drums than fifes are there?

4. Four fifers, one color bearer, and one leader are how many boys?

5. Four fifers and six drummers are how many boys?

6. If the boys march around two squares, how many blocks will they march? Draw the squares.

7. If they march three blocks away, and then back to the starting place, how many blocks do they march?

8. If they march 2 miles on Monday and 3 miles on Tuesday, how many miles do they march in both days?

9. When they march 3 blocks with music and 4 blocks without, how many blocks do they march?

10. When they march around the square twice, how many blocks do they go? Make a picture of the square.

11. If they have marched 9 blocks away from home and 5 blocks toward home, how far from home are they?

Keep pint and quart measures before pupils.

What is the first measure?
For what do we use it?
What is the second measure?
For what do we use it? Which is the larger?

Fill the pint measure with water. Pour it into the quart measure. Do it again. How much more will the quart measure hold? How many pints does the quart measure hold?

1. How many pints make a quart?

2. The quart measure will fill the pint measure how many times?

3. Two quarts are how many pints? Measure and prove it. Three quarts? Four, five, six quarts?

4. How many quarts are there in 4 pt.? Six, eight, ten, twelve pints? (*pt.* stands for *pint* or *pints*.)

5. Mary bought 3 quarts of milk. How many pints did she buy?

6. Alice filled a pint measure four times from a pitcher of water. How many times would the pitcher of water fill a quart measure? Why?

7. How many pint bottles can be filled from five quarts of cream?

8. How many quart cans will 12 pints of sirup fill?

9. How many pints of milk will 3 pint bottles and one quart bottle hold?

1. I spent 2 cents for a yeast cake, and 4 cents for candy. How much did both cost?

2. Mary had 3 red roses and two yellow ones. How many had she in all?

3. Two birds have how many wings?

4. Four boys have how many thumbs?

5. Three horses have how many ears?

6. If we work six days in a week, how many days do we rest?

7. Two dogs have how many feet?

8. A dime is made of silver. It is the same as ten cents.

A dime less two cents is how many cents?

9. How many oranges are there in a dozen?

10. Find the cost of 3 oranges at 2 cents apiece.

11. *Add:*

4	6	3	2	2	7	2	1	2	5
1	1	2	2	4	2	3	4	2	1
3	1	1	2	2	1	3	3	3	2

12. *Subtract:*

6	4	7	5	4	8	8	4	5	8
2	2	3	2	4	5	7	3	3	2

13. Count by 2's from 1 to 11.

14. Count by 2's from 2 to 10.

15. Count by 2's from 10 to 2.

16. Count by 2's from 11 to 1.

1. What two numbers added make 3?
2. Add two numbers to make 5.
3. Add two numbers to make 4.
4. Add two numbers to make 6.
5. What two numbers added make 7?
6. What three numbers added make 7?
7. What three numbers added make 10?
8. What three numbers added make 8?
9. What three numbers added make 9?

The sign +, called **plus**, between two numbers, means that they are to be added.

The sign −, called **minus**, between two numbers, means that the second is to be taken from the first.

10.	$6+?=8$	$9-?=3$	$7+2=?$	$5+?=9$
11.	$7+?=9$	$9-?=7$	$6+3=?$	$3+?=9$
12.	$2+?=5$	$6-?=2$	$7-2=?$	$5+?=7$
13.	$5+?=9$	$10-?=4$	$?-4=6$	$?-6=4$
14.	$3+?=6$	$7-?=2$	$?+3=6$	$7-5=?$

15. How many working days in two weeks?
16. How many days are 2 days less than a week?
17. A week and 3 days are how many days?
18. There were 7 apples in a basket. Frank took 1 in each hand. How many were left?
19. Eight boys went to the store for milk. Each bought a pint. How many quarts did they buy?

Many years ago, the Romans wrote numbers by means of letters. We use letters to make the numbers on the face of the clock, to number the chapters in a book, and for a few other purposes.

The Roman way of writing the first five numbers is this:

I stands for **one.** **III** stands for **three.**
II stands for **two.** **IV** stands for **four.**
V stands for **five.**

1. Using letters, write the number of eyes you have; the number of thumbs on one hand; the number of fingers on one hand; the number of quarts in six pints; the number of school days in a week.

2. When you attend school only 3 days in a week, how many days are you absent?

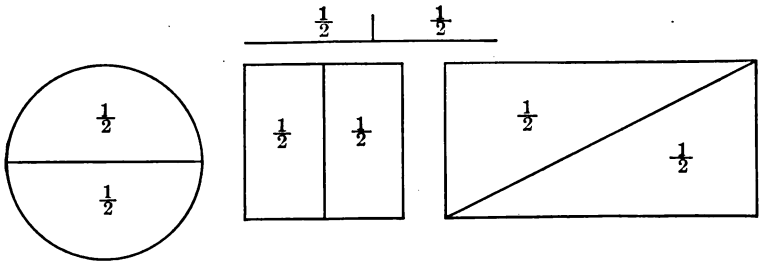
3. When the sun shines only three days in a week, how many days are cloudy?

4. Frank earned 10 cents and gave his sister 2 cents. How much money had he left?

5. Lucy has 3 cents. How many more cents must she have to buy a ten-cent jumping rope?

6. If Will earned 2 cents on Monday, 3 cents on Tuesday, and 4 cents on Saturday, how much did he earn?

7.	2	8	3	2	9	2	5	3	6	5
	+7	+2	+2	+5	+2	+10	+3	+7	+4	+5
8.	4	9	5	9	7	7	8	10	11	10
	−2	−2	−3	−7	−5	−2	−3	−7	−2	−5



1. Draw a line. Cut it into two equal parts. What is one part?

2. Fold your paper once in the middle. It is what part as large as before you folded it?

3. Point to one half of the circle at the top of the page.

4. Point to one half of the square at the top of the page.

5. One half of 4 cents is how many cents? (Picture.)

6. Take six counters. Find one half of them. One half of six are how many?

7. Find one half of eight; of 10; of 12.

8. Half a dozen apples at a cent each cost how much?

9. George bought a half dozen apples and gave 4 to Rose. How many had he left?

10. 4 days and how many days make a week?

11. How many cents in a half dime?

12.

2	4	3	2	6	3	2	10	12	11
×3	×2	×3	×5	×2	×4	×2	−3	−6	−5

1. Make 6 marks. Group them by 2's. How many 2's in 6? Group them again, showing 2 halves of 6. One half of 6 is how many?

2. Do the same with 8, 10, 12, 14, 16, 18, 20.

3. Read 42, 89, 76, 98, 73, 100.

4. Read I, IV, V, III, II.

5. *Add:*

6	6	5	3	4	2	5	8	4	3
2	3	2	6	4	1	1	1	2	3
3	1	7	5	4	3	2	2	3	3
2	1	1	2	2	4	3	2	2	3

6.

3	3	4	2	8	9	10	3	2	5
×4	×5	×4	×7	×2	×2	×2	×3	×3	×2

7. $2\overline{)6}$ $3\overline{)6}$ $2\overline{)4}$ $2\overline{)8}$ $2\overline{)10}$ $3\overline{)9}$ $2\overline{)12}$ $4\overline{)8}$

8. $3\overline{)12}$ $4\overline{)12}$ $5\overline{)15}$ $3\overline{)15}$ $6\overline{)12}$ $2\overline{)14}$ $7\overline{)14}$

9. Find $\frac{1}{2}$ of 6 cents; $\frac{1}{2}$ of 14 marbles; $\frac{1}{2}$ of 8 birds.

10.

4	5	7	2	8	2	2	14	10	5
+2	+2	+2	+4	+2	+11	+13	+1	+2	+3

11.

5	8	9	5	7	7	8	11	12	11
−2	−3	−4	−3	−4	−3	−5	−5	−6	−6

12. *Add:*

2	3	2	4	8	7	3	2	9	1
1	4	5	3	1	2	2	1	1	2
1	1	1	1	2	3	4	2	2	3
2	5	2	2	1	1	1	4	1	6

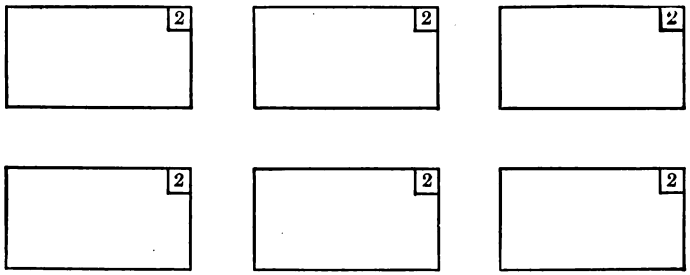
1. VI = 5 + 1 = 6 VII = 5 + 2 = 7 VIII = 5 + 3 = ?

2. X = 10 IX = 10 − 1 = 9 XI = 10 + 1 = 11
XII = 10 + 2 = ?

3. How many 2-cent stamps would cost as much as a 12-cent kite?

4. How many school days in 2 weeks? How many working days? How many days in all?

5.



What did the stamps on these letters cost?

6. Five 2's are how many? Six 2's are how many?

7. *Write in Roman:*

a. The number of cents in a dime.
b. The number of feet your cat has.
c. The number of pints in 4 quarts.
d. The number of lemons in a dozen.
e. The number of eggs in a half dozen.
f. The number of days in a week.
g. One less than a dozen.

8. Grace is reading Chapter X in her book and Frank is reading Chapter VII. Grace is how many chapters ahead of Frank?

1. Count these dots by 2's: ⁘⁘⁘⁘⁘⁘ How many 2's are there? How many dots are there in the upper row? In the lower row? Twelve dots are what part of 24 dots?

2. Make dots to show two 2's; three 2's; four 2's; five 2's; seven 2's; nine 2's; six 2's; eleven 2's.

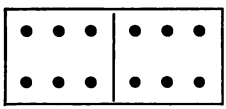
3. How many 2's are there in 4? In 8? In 10? In 14? In 20? In 22? In 16? In 24? In 6?

4. Show that there are two 12's in 24, thus,

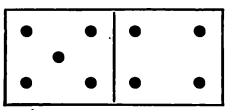
⁘⁘⁘⁘⁘⁘ = 12
⁘⁘⁘⁘⁘⁘ = 12

5. Show that there are two 8's in 16.

6. Show how many tens there are in 20.

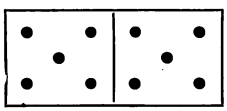


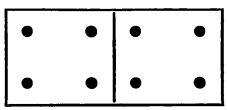
7. This domino shows that $6+6=12$, that $12-6=6$, that two 6's $=12$, that six 2's $=12$, and that $\frac{1}{2}$ of $12=6$.

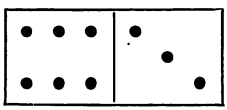


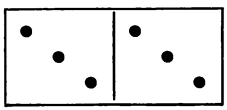
8. This domino shows that $5+4=$ ——, that $9-5=$ ——, and that $9-4=$ ——.

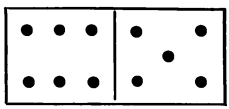
9. Tell what is shown by each of these dominos:











10. 2 4 8 12 7 5 3 9 11 10

+2 +4 +8 +12 +7 +5 +3 +9 +11 +10

1. Count • : : : : :
1 3 5 7 9 11

2. 9 and 2 are how many?

3. Count • : : : : : : : : : : 19 + 2 = ?

4. 29 + 2 = ? 39 + 2 = ? 49 + 2 = ? 59 + 2 = ? 69 + 2 = ? 79 + 2 = ? 89 + 2 = ? 99 + 2 = ?

5. Count by 2's from 1 to 99.

6. Count by 2's from 99 to 1.

7. John had 7 marbles and bought 6 more. How many had he then? Show by a picture.

8. 7 + 6 = ? 6 + 7 = ? 13 − 6 = ? 13 − 7 = ?

9. Arthur paid 8 cents for a tablet and 6 cents for pens. What did both cost? 8 and 6 are how many?

10. William had 14 cents. He paid 6 cents for a quart of milk. How many cents had he left? (Picture.)

11. A boy found 14 eggs in a nest and sold a dozen. How many were left? Show by a picture.

12. *Add:*

6	2	6	6	2	2	6	2	1	1
1	3	2	3	2	2	4	3	3	2
3	5	3	1	7	3	1	1	2	1
2	2	2	1	1	2	2	2	3	3
1	1	1	3	5	8	1	4	5	1

13. *Subtract:*

4	5	8	11	13	9	8	10	12	13	14	15
2	3	5	6	7	3	2	5	7	6	8	7

1. A year and 3 months are how many months?

2. Our baby is 11 months old. How old will he be 3 months from now?

3. A dozen and three oranges are how many oranges?

4. Make dominoes that count 5, 7, 10, 9, 11.

5. A dozen and 4 eggs are how many eggs? (Picture.)

6. Alice is 16 years old and Ethel 4 years younger. How old is Ethel?

7. James picked 9 quarts of cherries and Donald 4 quarts. How many quarts did both pick?

8. A boy earned 14 cents and gave his sister 11 cents. How many cents had he left?

9. How many evening papers at 2 cents apiece will 18 cents buy?

10. How many shoes in 10 pair? In 12 pair?

11. Nine robins have how many feet?

12. How many 2's in 14? 20? 22? 24? 18? 16?

13. Find $\frac{1}{2}$ of 8 books; of 12 pints; of 16 cents; of 10 dollars.

14. *Answer each of these questions in three ways:*

?+?=10	?+?=16	?+?=14	?+?=15
8−?= ?	14−?= ?	13−?= ?	16−?= ?

17. *Add:*

6	6	5	3	4	3	1	7	3	7
2	3	2	6	4	5	2	3	2	1
3	1	7	2	4	2	3	4	4	2
2	1	1	5	2	1	4	6	3	8

NOTE. — If possible, let each pupil be provided with a yardstick. At least have several. Let pupils have much practice in estimating and measuring.

1. Draw a line 1 yard long on the blackboard.

2. Find something in the room a yard long or wide.

3. How long do you think the schoolroom is? How wide? Measure it. Find something 1 yard high.

4. Name some things that are always measured by the yard.

5. Without the yardstick draw a line one yard long. Measure and correct it. A line 2 yards long.

6. How long do you think the blackboard is? Measure it, and see how nearly correct your estimate is.

7. Hold your hands 1 yard apart. Hold them 1 yard above the floor.

NOTE. — *yd.* stands for *yard* or *yards.*

8. What will 2 yd. of ribbon cost at 7 cents a yard?

9. How many yards of ribbon will 22 cents buy at 2 cents a yard?

10. Draw a line 1 yd. long. Divide it into 3 equal parts. What is one of these parts?

11. Hold your hands one foot apart. Draw a line 1 foot long. Hold your hand one foot above your desk.

12. How many feet high are you?

13. Without a rule draw a line 2 feet long. Measure and correct it. Do the same with lines 3, 4, 5, and 6 feet long.

1. How many feet are there in 2 yd.? In 3 yd.? In 4 yd.? In 5 yd.?

NOTE. — *ft.* stands for *foot* or *feet*.

2. How many yards in 15 ft.?

3. A line 6 yd. long is how many feet long?

4. A line 6 ft. long is how many yards long?

5. Count by 3's from 0 to 24 and back to 0.

6. Two 3's are how many? Four threes? Seven 3's? Six 3's? Three 3's? Five 3's? Eight 3's?

7. Nellie's father is 6 ft. tall. His height is the same as how many yards?

8. Seven yards of cloth are how many feet long?

9. $7+3=?$ $9+3=?$ $12+3=?$ $13+3=?$

10. $5-3=?$ $11-3=?$ $8-3=?$ $9-3=?$

11. *Add:*

4	4	3	4	2	3	4	5	7
3	6	5	7	1	4	6	1	2
5	3	3	3	3	2	3	2	3
3	3	7	2	4	1	1	3	1
				3	1	2	1	4

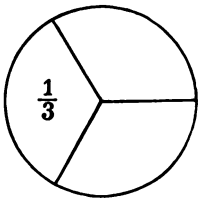
12. *Subtract:*

13	12	15	16	11	11	12	10	9	10
7	6	3	4	9	2	3	7	5	3

13. *Multiply:*

8	3	4	11	12	9	10	3	2	7
2	5	3	2	2	2	2	3	4	3

14. *Divide:* $2\overline{)6}$ $3\overline{)6}$ $4\overline{)12}$ $3\overline{)12}$ $3\overline{)15}$ $8\overline{)16}$ $2\overline{)14}$



1. Divide a yard into feet. One foot is what part of a yard? One third of 3 ft. is how many feet?

2. One third of 6 cents are how many cents? ○¦○¦○ ○¦○¦○

3. How many 3's in 6? $\frac{1}{2}$ of 6 = ? ○○○ ○○○

How many 2's in 6? $\frac{1}{3}$ of 6 = ?

4. $\frac{1}{3}$ of 9 feet are how many feet?

5. $\frac{1}{3}$ of 3 yd. are how many yards?

6. Three 3's are how many?

7. $\frac{1}{3}$ of 9 dots are how many dots? ⁘ ⁘ ⁘

8. How many 3's in 9?

9. Four times 3 are how many? ⁘ ⁘ ⁘

10. How many 3's in 12? $\frac{1}{3}$ of 12 = ? ⁘ ⁘ ⁘

11. A ribbon 12 ft. long is how many yards long?

12. Five 3's are how many? Show this by a picture.

13. $\frac{1}{3}$ of 15 = ? How many 3's in 15?

14. Six 3's are how many? $\frac{1}{3}$ of 18 = ? How many 3's in 18? Show this with dots.

15. An orchard has 3 rows of trees with 8 trees in a row. How many trees in the orchard? Make a picture of it.

Keep the measures before the class.

1. What measures are these? For what is the quart measure used? For what is the gallon measure used?

2. Fill the quart measure with water. Pour it into the gallon measure. Repeat till the gallon measure is full. How many times did you empty the quart measure? How many quarts make a gallon (*gal.*)? Write on the blackboard what you have learned.

3. How many quarts in 2 gallons? In 3 gallons? In 6 gallons? In 5 gallons? In 4 gallons?

4. How many pints in 1 gallon? In 2 gallons?

5. A gallon of milk costs how much at 5 cents a quart?

6. Two quarts were spilled from a gallon of water. How much remained?

7. What must I pay for a gallon of vinegar at 6 cents a quart?

8. Eight quarts are equal to how many gallons? 16 qt.? 24 qt.?

9. Count by 4's from 0 to 24; from 1 to 13; from 2 to 18; from 3 to 15; from 2 to 26.

10. $\frac{1}{2}$ of 4 qt. are how many quarts? How many quarts in a half gallon?

11. Count by 3's from 1 to 37; from 2 to 38.

12. Count by 2's from 0 to 50 and back; from 1 to 51 and back.

1. $9+2=?$ $19+2=?$ $29+2=?$ $39+2=?$

2. $11-2=?$ $21-2=?$ $31-2=?$ $41-2=?$

3. When you buy 5 quart bottles and 2 pint bottles of milk, how many quarts do you get?

4.

2	3	4	3	5	3	2	4	6
+2	+2	+1	+4	+2	+4	+3	+2	+2

5.

7	5	4	7	6	8	6	5	6
−2	−4	−2	−4	−3	−3	−1	−4	−4

6. $XIII = 10+3 = 13$. $XIV = 10+4 = ?$

7. Express 13 and 14 in Roman notation.

8. *Copy in figures and give answers:*

$III+II=?$ $V-III=?$ $V-II=?$ $IV+VIII=?$
$V+III=?$ $II+X=?$ $V+VII=?$ $VIII+V=?$

9.

3	4	3	4	4	2	12	10	11
×6	×4	×8	×6	×5	×8	×2	×2	×2

10. $4\overline{)12}$ $3\overline{)15}$ $4\overline{)20}$ $3\overline{)21}$ $4\overline{)24}$ $4\overline{)16}$ $4\overline{)12}$ $3\overline{)18}$

11. $XV = 10+5 = 15$. $XVI = 10+6 = ?$

12. Express in Roman all the numbers to **16.**

13. *Copy in figures and give answers:*

$V+V=?$ $VIII+IV=?$ $III+IX=?$

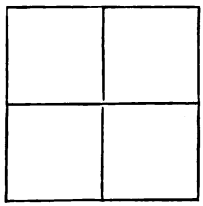
14. *Add:*

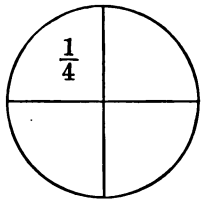
4	6	3	2	4
1	1	2	3	2
3	4	4	2	4

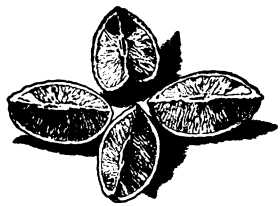
15. *Subtract:*

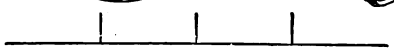
6	9	7	5	4	8
2	3	3	2	4	5

16. Count by 3's from 1 to 22.









1. How many fourths are there in the square? In the line? In the circle? In the orange?

2. Draw a foot line and divide it into four equal parts. What is each part called?

3. One quart is what part of a gallon?

4. One fourth of 8 is how many? ⁘|⁘|⁘|⁘

5. Show with dots $\frac{1}{4}$ of 12; of 20; of 16; of 24.

6. How many 3's in 12? How many 4's in 12?

7. How many 4's in 20? How many 5's in 20? How many 4's in 24? How many 6's in 24?

8. How many are three 4's? Four 5's? Four 6's?

9. If a pound of candy costs 20 cents, what does $\frac{1}{4}$ of a pound cost?

10. $16 \div 4 = ?$ $8 \div 2 = ?$ $\frac{1}{4}$ of $8 = ?$ $\frac{1}{4}$ of $16 = ?$

11. XVII = 10 + 7 = 17. XVIII = 10 + 8 = ?
XIX = 10 + 9 = 19. XX = 10 + 10 = ?

12. *Write in figures:* I; III; V; X; IX; XI; VIII; XIII; XV; XIV; XII; II; VI; VII; XVI; XX.

NOTE. — Enlarge and fix the idea of *fourth* by having papers cut in various forms, and then cut or folded into fourths.

1. Count by 5's to 50 and back; from 1 to 36 and back.

2. A nickel is equal to a half dime. Two nickels are the same as how many cents?

3. Three fives are how many? Seven fives?

4. $5+4=?$ $4+5=?$ $9-4=?$ $9-5=?$ $5+?=7$

5. $5+5=?$ $10-?=5$ $6+5=?$ $8+5=?$ $7+5=?$

6. Give answers in Roman: Two fives = ? Four 5's = ? $7+2=?$ $6+6=?$ $5+5=?$ $9+2=?$ $10+2=?$

7. How many school days are there in one week? Three weeks? Four weeks? Six weeks? Five weeks?

8. How many working days in 4 weeks? In 1 week? In 3 weeks? In 2 weeks?

9. How do you find $\frac{1}{2}$ of anything? $\frac{1}{3}$? $\frac{1}{4}$? $\frac{1}{5}$?

10. Draw a line and divide it into 5 equal parts. What is one of these parts?

11. What is $\frac{1}{5}$ of 10? Of 20? Of 25? Of 15?

12. Count by 3's from 1 to 37; from 2 to 35.

13. Find $\frac{1}{2}$ of 18; $\frac{1}{3}$ of 6; $\frac{1}{4}$ of 12; $\frac{1}{2}$ of 22; $\frac{1}{5}$ of 15.

14. Find $\frac{1}{2}$ of 24; $\frac{1}{3}$ of 12; $\frac{1}{2}$ of 6; $\frac{1}{4}$ of 16; $\frac{1}{3}$ of 15.

15. How many cents had Dick when he had earned 5 cents and his father had given him a nickel?

16. Nina's bank contained 13 cents and she took out a half dime. How much remained?

17. Jack had 3 cents. How much more did he need to buy a 10-cent ball?

18. $9+5=?$ $10+5=?$ $12+5=?$ $11+5=?$ $13+5=?$

1. With a rule, draw a line one foot long. Divide it into 12 equal parts. What is one of these parts? How many inches make one foot? (*in.* stands for *inch* or *inches.*)

2. Divide the foot line into halves. How many inches in one half of a foot?

3. Divide the foot line into thirds. How many inches are $\frac{1}{3}$ of a foot? $\frac{1}{3}$ of 12 inches are how many inches? Four is what part of 12? How many 4's in 12?

4. Divide the foot line into 4 equal parts. What part of a foot is one of these equal parts? How many inches in $\frac{1}{4}$ of a foot? How many 3's in 12? What part of 12 inches is 3 inches?

5. How many inches in 2 ft.? $2 \times 12 = ?$

6. A foot and 2 in. are how many inches?

7. A foot and 3 in. are how many inches? A foot less 3 in.? Hold your hands 3 in. apart; 6 in.; 10 in.

8. How many inches wide do you think your desk is? Measure it and see.

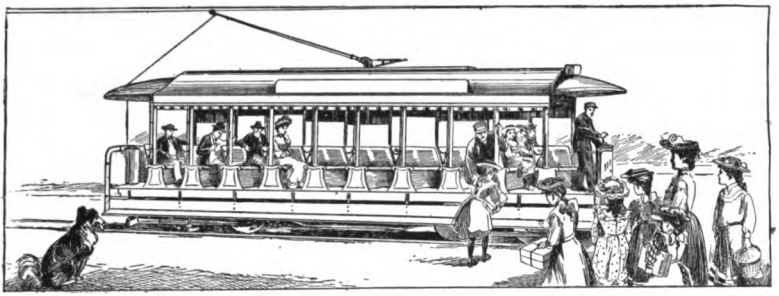
NOTE. — Have much estimating and measuring to fix ideas.

9. A chalk box is 8 in. long and 4 in. wide. How many inches of string would reach around it?

10. How many inches are there in all the sides of an inch square? A 2-inch square? A 3-inch square? A 4-inch square? A 6-inch square? Draw these squares.

11. How many feet in 24 inches? 12 inches are what part of 24 inches?

12. Count by 3's to 36. How many 3's in 36?



1. This picture shows 9 girls and their teacher, starting for the park, which is 12 miles from the city. The car passes through a village 7 miles from the city. That is how far from the park? Draw a line to show the railroad, and make crosses on it to show the city, village, and park.

2. Each seat in the car will hold 5 persons. Count by 5's and find how many persons can be seated in the car.

3. How many seats were needed for this party?

4. How many persons will 6 seats hold?

5. At the village 5 more girls joined the party. How many girls were there in the party then?

6. The fare from the village to the park is 5 cents. How many cents did the 5 girls pay?

7. How many fares would 2 dimes pay?

8. The entire trip was made in 1 hour. How many miles did the car go in a half hour?

9. Mary had 14 cents to use at the park. She bought a bag of peanuts for a nickel and some candy for 4 cents. What did she pay for all? How much had she left?

1. Count by 6's from 0 to 24; from 2 to 20; from 3 to 21; from 5 to 23; from 4 to 22.

2. How many working days in 2 weeks? In 4 weeks? In 3 weeks? In 5 weeks?

3. Count by 6's from 24 to 0.

4. Julia bought a tablet for 6 cents. She gave the clerk a dime. How much change should she receive?

5. Sarah is 12 years old. Mary is 6. What is the difference between their ages?

6. If Grace is 6 years older than Sarah, how old is Grace?

7. What must be paid for a slate worth a dime and a picture worth 6 cents?

8. How many papers must Frank sell at 2 cents apiece to get 10 cents?

9. Eleven marbles and six marbles are how many?

10. If you can buy 6 marbles for a cent, how many can you buy for 4 cents?

11. Twelve is what part of 24? 6 is what part of 24?

12. Six inches are what part of a foot? 3 inches?

13. Six is $\frac{1}{2}$ of what? $\frac{1}{3}$ of what? $\frac{1}{4}$ of what?

14. *Add:*

6	6	6	6	6	2	6	6	6	2
6	6	6	6	2	6	5	1	2	2
	6	6	6	6	6	4	5	3	7
		6	6	1	2	3	4	6	6
			6	6	3	2	2	2	1

1. Count by 7's from 0 to 28; from 28 to 0.

2. *Add:*

7	7	7	7	5	7	6	7	4	1
7	7	7	3	2	5	2	3	7	9
	7	7	4	6	7	3	7	2	3
		7	2	7	3	7	1	7	7

3. *Multiply:*

7	7	7	6	5	3	5	3	2	4
2	3	4	4	6	6	4	5	7	4

4. *Subtract:*

7	9	11	14	19	16	12	13	10	15
7	7	7	7	7	7	7	7	7	7

5. $7\overline{)14}$ $7\overline{)28}$ $7\overline{)21}$ $7\overline{)7}$ $3\overline{)15}$ $3\overline{)18}$ $6\overline{)18}$ $4\overline{)20}$

6. *Add:*

7	2	2	7	7	7	6	7	5	7
7	2	2	3	4	5	3	3	7	6
4	7	7	3	3	3	2	3	2	5
3	2	6	6	4	2	7	3	2	4

7. Count by 7's from 1 to 29; from 5 to 26.

8. $17-7=?$ $19-7=?$ $19-12=?$ $7+?=14$

9. $\frac{1}{2}$ of 14 marbles are how many marbles?

10. 7 is $\frac{1}{3}$ of what number? $\frac{1}{4}$ of what?

11. How many days are there in 2 weeks? In 3 weeks? In 4 weeks? A week is what part of 21 days?

1. Count by 8's to 24. $8+8+8=?$ Three 8's are how many?

2. $8+8=?$ $16-8=?$ $8+?=16.$ $16+?=24.$

3. What is $\frac{1}{3}$ of 24? How many 8's in 24?

4. 8 cents and a half dime are how many cents? A dime and 8 cents? 8 cents and what make a dime?

5. A dozen pencils are how many more than 8?

6. How many quarts in a gallon? How many pints in a quart? How many pints in a gallon?

7. How many pints in 2 gallons? In 3 gallons?

8. A dozen and 8 lemons are how many lemons?

9. Draw on the blackboard a figure like this, making it 10 inches long and 8 inches wide. How many inches across both ends? Across both sides? Across one end and one side?

10. $10+10=?$ $8+8=?$ $10+8=?$ $18-10=?$

11. Mary is 11 years old and Helen 8. What is the sum of their ages? $11+8=?$ $19-11=?$ $19-8=?$

12. Dorothy is 11 years old and Helen 7. What is the sum of their ages? $18-7=?$ $18-11=?$ $?+?=18.$

13. A foot and 7 inches are how many inches? A foot and 9 inches? A foot and 11 inches? A foot and 10 inches?

14.

13	15	16	17	23	21	18	17
-8	-7	-8	-9	-11	-11	-10	-10

15. $3\overline{)24}$ $6\overline{)24}$ $12\overline{)24}$ $8\overline{)24}$ $4\overline{)24}$ $6\overline{)12}$ $2\overline{)16}$

1. My rule is 2 feet long. How many inches long is it?

2. 14 oranges are how many more than a dozen?

3. Harry visited his uncle, 15 miles from Harry's home. He rode 12 miles and walked the rest of the way. How far did he walk?

4. Willie had 16 marbles and lost 4. How many had he left? $16-4=?$ $12+12=?$ $12\times 2=?$ $14-12=?$

5. 12 cents and a half dime are how many cents?

6. A half dozen cakes are how many cakes? How many are a dozen and a half dozen? $12+6=?$ $12+5=?$

7. Jennie had 2 dimes. How many cents had she? She bought a pad for 8 cents. How many cents had she left? $20-8=?$ $12+8=?$ $20-12=?$

8. To-day is the 12th day of the month. A week from to-day is what day of the month? $12+7=?$ $19-12=?$ $19-7=?$

9. Ralph has 21 chickens; 9 of them are white and the rest are brown. How many are brown? $21-9=?$

10. A dime and 12 cents are how many cents?

11. A foot and 11 inches are how many inches?

12. *Add:*

11	4	9	3	6	3	2	5	6
4	5	2	2	5	4	4	5	2
2	3	1	7	6	5	6	5	3
2	6	9	12	5	12	3	5	6

13.	17	16	21	23	19	18	15	13
	−9	−7	−11	−12	−11	−12	−9	−7

1. XXI = 10 + 10 + 1 = 21 XXII = 10 + 10 + 2 = ?
XXIII = 10 + 10 + 3 = 23 XXIV = 10 + 10 + 4 = ?

2. Write in Roman all the numbers to 24.

3. 6 gallons of cream are how many quarts?

4. 24 cents will buy how many 8-cent tablets?

5. 24 peaches are how many dozen? (Picture.)

6. How many pints of milk in 12 quarts?

7. A rule is 2 ft. long. How many inches long is it? How many 6-inch pieces would it make? 4-inch pieces?

8. *Add:*

8	8	4	12	11	2	8	5	4
7	1	2	3	3	2	4	2	5
3	1	6	2	4	9	3	6	6
2	8	5	3	1	8	2	3	5

9.

8	2	3	2	4	8	12	5	6
×3	×11	×8	×8	×6	×2	×2	×4	×3

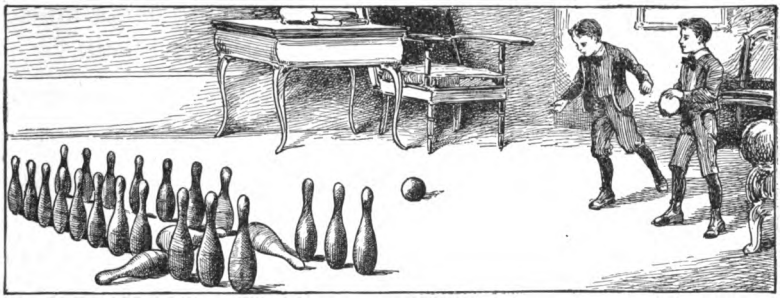
10. *Multiply:*

6	6	6	5	4	4	8	9	3
3	4	5	4	3	5	2	2	5

11. *Add:*

5	2	2	2	1	2	2	2	5
6	2	2	9	5	5	5	2	2
3	5	8	4	7	5	5	5	10
2	7	5	1	3	6	4	9	10

12. $5\overline{)25}$ $5\overline{)20}$ $5\overline{)10}$ $4\overline{)20}$ $3\overline{)15}$ $2\overline{)10}$ $5\overline{)15}$ $6\overline{)12}$



1. How many tenpins are there in this game? They were set in 2 rows; how many were there in each row?

2. If they were set in 3 rows, how many would there be in each row? (Picture it.) If they were set in 4 rows? (Picture.) If they were set in 6 rows? (Picture.)

3. Each boy has four plays. Charles puts down 3, 7, 5, 2. James puts down 8, 6, 4, 2. Which wins?

4. Here is the score. Find who wins in each game.

	James	Charles		James	Charles		James	Charles
a.	8	9	*b.*	8	2	*c.*	6	4
	3	5		5	2		2	6
	5	2		7	3		4	3
	2	3		3	12		6	4
d.	7	6	*e.*	6	4	*f.*	10	11
	3	4		7	11		3	0
	2	8		3	5		1	0
	7	2		5	2		10	11

NOTE. — Play more games, varying them.

1. Helen has a half dime. May has 3 times as much. How much money has May? How much have both?

2. Jennie earned 14 cents and paid a dime for note paper. How much had she left?

3. Divide 20 cents among 4 girls. How much does each get?

4. A dime, a half dime, and 2 cents are how many cents?

5. How many shoes do 9 children wear?

6. If a lady writes one letter a day, what do her postage stamps for a week cost?

7. How many candles are there in 3 boxes if each box holds six?

8. How many feet in 8 yards?

9. In a rose bed are 3 rows of bushes, with 8 bushes in each row. (*a*) How many rosebushes in the bed? (Picture.) (*b*) How many bushes in 2 of the rows? If there were 4 rows, how many bushes would there be in each row? (Picture.)

DRILL TABLES

NOTE. — The drill tables on page 31 contain those additions and subtractions that require most repetition. It is a waste of time to repeat combinations that are perfectly known.

Copy these tables on the blackboard and go through them daily as a rapid drill exercise. Vary the order, sometimes going across and sometimes up and down. Occasionally let pupils take turns in pointing while others answer. Erase, and change the order frequently.

In the subtraction table, let results be given in both forms — "4 from 12 leaves 8" and "4 and 8 are 12."

See note, page 30.

ADDITION DRILL TABLE

9	2	7	4	12	8	9	11	3	6	5
2	11	8	12	7	11	12	11	12	8	4
11	5	10	5	9	12	5	8	9	5	2
12	9	11	7	4	12	11	12	11	8	12
6	3	12	6	6	7	7	6	4	3	6
9	8	5	7	11	4	7	4	11	9	5
8	9	11	8	7	10	3	8	6	5	6
4	9	7	8	9	12	11	9	12	7	6

SUBTRACTION DRILL TABLE

12	18	18	16	22	16	14	17	18	10	19
4	9	7	8	12	9	11	9	12	6	9
15	11	17	13	17	11	14	10	15	12	11
9	8	5	7	11	4	7	4	11	9	5
23	14	21	12	13	24	16	20	20	13	14
12	9	11	7	4	12	11	12	11	8	12
11	13	15	16	19	19	21	22	15	17	9
2	11	8	12	7	11	12	11	12	7	4
12	20	18	19	16	22	14	17	18	8	14
8	9	11	8	7	10	3	8	6	5	8
15	11	17	13	17	11	10	16	15	10	11
6	3	12	6	6	7	5	6	4	3	6
23	14	21	12	13	8	16	20	7	13	14
11	5	10	5	9	3	5	8	4	5	2
11	13	15	16	19	12	21	8	12	9	9
9	2	7	4	12	6	9	4	3	6	5

PART II

1. **One hundred** is written **100**; **two hundred** is written **200**; **five hundred** is written **500**.

Write four hundred; seven hundred; eight hundred.

2. Read 300; 600; 700; 400; 200; 500; 900.

3. 324 is read, **three hundred twenty-four.**

642 is read, **six hundred forty-two.**

Read 759; 483; 279; 585; 986; 361; 416; 313.

4. Write four hundred twenty-one; three hundred forty-nine; six hundred fifty-two; one hundred forty-one; two hundred ninety-one; seven hundred sixteen; nine hundred seventy-seven.

5. Six hundred nine is written 609.

Eight hundred ten is written 810.

Write three hundred eight; four hundred six; nine hundred one; two hundred fifteen.

6. Read 749; 982; 507; 308; 701; 209; 685; 420.

7. Read 385; 769; 835; 429; 651; 910; 203; 519.

8. Write five hundred ninety; five hundred nine; nine hundred forty-one; three hundred sixty.

9. The *right-hand* figure is called **units'** figure, the *second*, **tens'** figure, the *third*, **hundreds'** figure.

634 is 6 *hundreds*, 3 *tens*, and 4 *units*.

Tell the number of hundreds, tens, and units in 246; 321; 245; 807; 650; 718; 320; 510; 408; 907.

1. Add 59 and 8.

59
8
67

8 units and 9 units are 17 units.
17 units = 1 ten and 7 units.
1 ten and 5 tens are 6 tens. 67 *Answer.*

2. Add 68 and 96.

68
96
164

6 units and 8 units are 14 units.
14 units = 1 ten and 4 units.
1 ten, 9 tens, and 6 tens are 16 tens.
16 tens = 1 hundred and 6 tens. 164 *Answer.*

NOTE. — Explanations of processes in addition, subtraction, multiplication, and division should not be dwelt upon unduly. Yet it is well for children to see how results are obtained, though they may not be required to repeat an intricate analysis of the operation.

Add:

3. 28	4. 36	5. 93	6. 29	7. 43	8. 78	9. 66
4	7	8	9	9	3	8
10. 42	11. 96	12. 28	13. 46	14. 29	15. 37	16. 42
8	9	3	5	6	8	9
17. 86	18. 42	19. 96	20. 18	21. 16	22. 19	23. 86
33	69	25	73	46	43	44
24. 35	25. 96	26. 98	27. 99	28. 10	29. 70	30. 52
48	57	63	34	48	30	19
31. 87	32. 85	33. 18	34. 17	35. 67	36. 45	37. 93
24	49	14	15	24	85	29

Add:

1. *a.* 7, 4, 3, 2 — *b.* 5, 4, 6, 1 — *c.* 4, 7, 2, 3 — *d.* 2, 4, 6, 5 — *e.* 12, 17, 30, 20 — *f.* 22, 31, 42, 4 — *g.* 22, 11, 33, 21 — *h.* 12, 11, 11, 24

2. *a.* 41, 13, 21, 13 — *b.* 51, 42, 63, 12 — *c.* 41, 20, 75, 32 — *d.* 51, 62, 73, 80 — *e.* 61, 33, 40, 54 — *f.* 72, 80, 61, 53 — *g.* 33, 55, 40, 61

3. 28, 45, 16, 34

4 units, 6 units, 5 units, and 8 units, are —— units.
23 units = —— tens and —— units.
2 tens, 3 tens, 1 ten, 4 tens, and 2 tens are —— tens.
—— tens = —— hundred and —— tens. 123 *Answer.*

4. *a.* 15, 24, 35, 14 — *b.* 24, 16, 33, 12 — *c.* 17, 34, 23, 52 — *d.* 15, 34, 26, 41 — *e.* 54, 47, 32, 23 — *f.* 12, 24, 16, 35 — *g.* 19, 82, 41, 63

5. *a.* 22, 43, 14, 37 — *b.* 24, 33, 17, 26 — *c.* 17, 26, 34, 43 — *d.* 15, 25, 37, 12 — *e.* 56, 34, 12, 29 — *f.* 17, 25, 34, 40 — *g.* 46, 20, 32, 55

6. *a.* 23, 42, 25, 12 — *b.* 14, 18, 22, 14 — *c.* 26, 13, 47, 12 — *d.* 25, 43, 58, 64 — *e.* 46, 34, 55, 42 — *f.* 29, 41, 32, 68 — *g.* 92, 8, 31, 40

1. Find the whole cost of a pencil at 5 cents, a tablet at 8 cents, and a stamp at 2 cents.

2. 5 cents, 2 cents, 4 cents, and 12 cents are —— cents.

3. If a peach cost 2 cents, an orange 6 cents, and a pineapple 12 cents, they all cost —— cents.

4. Add 2 to 9; 19; 29; 39; 49; 59; 69; 79; 89; 99.

5. Add 3 to 8; 18; 28; 38; 48; 58; 68; 78; 88; 98.

6. 7+4=? 17+4=? 27+4=? 37+4=? 47+4=?

7. 7+5=? 17+5=? 27+5=? 37+5=? 57+5=?

8. *Add:*

7	17	27	37	47	57	67	77	87	97
6	6	6	6	6	6	6	6	6	6

9. Count by 3's from 0 to 30; from 1 to 31; from 2 to 32.

10. Count by 4's from 0 to 40; from 1 to 37; from 2 to 38.

11. Count by 2's from 50 to 0; from 49 to 1.

12. Count by 5's from 1 to 31; from 3 to 33.

13. Count by 6's from 30 to 0; from 5 to 29.

14. Count by 6's from 1 to 31; from 3 to 27.

15. Count by 7's from 0 to 35; from 1 to 29; from 2 to 30.

16. A kite, an orange, a ball, and a top each cost 5 cents. How much did all cost?

1. *Add:*

7	17	37	47	57	67	77	87	27
7	7	7	7	7	7	7	7	7

2.

7	17	27	37	47	57	77	87	67
9	9	9	9	9	9	9	9	9

3.

7	17	57	87	67	37	47	27	77
8	8	8	8	8	8	8	8	8

4.

6	16	26	46	36	86	56	76	66
5	5	5	5	5	5	5	5	5

5.

6	16	56	86	96	5	15	85	45
4	4	4	4	4	5	5	5	5

6.

6	16	26	36	56	86	66	46	76
6	6	6	6	6	6	6	6	6

7.

6	16	26	36	46	86	56	66	76
7	7	7	7	7	7	7	7	7

8.

6	16	36	86	56	76	66	46	26
9	9	9	9	9	9	9	9	9

9.

6	16	36	56	26	86	46	76	66
8	8	8	8	8	8	8	8	8

10.

5	15	25	35	85	75	45	65	55
6	6	6	6	6	6	6	6	6

11.

5	15	35	65	85	75	45	25	55
7	7	7	7	7	7	7	7	7

1. *Add:*

24		*The numbers added* are **addends.**
12	*Addends*	*The result of addition* is the **sum.**
36		
14		
86	*Sum*	

NOTE. — In adding, do not repeat the figures. In example **1**, say { 4, 10, 12, 16. / 2, 5, 6, 8.

2.	*a.*	12	*b.*	23	*c.*	24	*d.*	37	*e.*	97	*f.*	54	*g.* 61
		36		27		58		35		35		33	32
		24		45		32		46		56		25	45
		15		56		46		25		87		29	37
3.	*a.*	13	*b.*	21	*c.*	33	*d.*	39	*e.*	83	*f.*	66	*g.* 98
		42		42		24		40		21		42	32
		25		31		44		8		40		81	43
		67		56		55		60		9		38	37
4.	*a.*	88	*b.*	66	*c.*	99	*d.*	22	*e.*	90	*f.*	42	*g.* 98
		42		42		88		39		88		66	21
		36		91		32		42		19		37	32
		77		33		41		70		18		41	14
5.	*a.*	62	*b.*	22	*c.*	32	*d.*	33	*e.*	21	*f.*	61	*g.* 64
		14		44		45		25		15		28	38
		28		91		16		40		17		33	21
		33		18		94		28		83		25	45
6.	*a.*	22	*b.*	39	*c.*	29	*d.*	88	*e.*	96	*f.*	24	*g.* 81
		33		41		38		64		38		86	28
		44		80		50		49		80		19	72
		55		16		96		82		19		81	19

1. *Add:*

	5	15	25	65	85	55	75	35	45
	9	9	9	9	9	9	9	9	9
2.	5	15	85	75	25	55	35	65	45
	8	8	8	8	8	8	8	8	8
3.	7	7	7	7	7	7	7	74	7
	4	14	34	54	84	64	44	7	24
4.	4	4	4	4	3	13	23	7	7
	6	16	26	46	7	7	7	53	63
5.	4	14	24	34	44	54	84	64	74
	7	7	7	7	7	7	7	7	7
6.	4	8	8	54	8	64	44	8	24
	8	14	34	8	74	8	8	84	8
7.	4	14	24	34	9	9	74	9	9
	9	9	9	9	44	54	9	84	64
8.	3	13	23	8	8	73	8	83	8
	8	8	8	43	33	8	53	8	63
9.	3	13	53	23	73	9	9	33	9
	9	9	9	9	9	43	83	9	63
10.	2	12	32	22	52	72	9	9	9
	9	9	9	9	9	9	82	62	42

11. $17+4=?$ $48+5=?$ $39+7=?$ $56+8=?$

1. Count by 2's from 0 to 50; from 1 to 51.

2. Count by 3's from 0 to 51; from 2 to 47.

3. Count by 4's from 0 to 100; from 2 to 102.

4. Count by 4's from 1 to 101; from 3 to 103.

5. Count by 5's from 2 to 97; from 1 to 101.

6. Mrs. Smith buys a pint of cream every day. How many quarts does she buy in 24 days?

7. One half of a foot is how many inches? $\frac{1}{3}$ of a foot? $\frac{1}{4}$ of a foot? $\frac{1}{6}$ of a foot? (Picture.)

8. Five gallons of milk will serve how many customers if each takes a quart? If each takes a pint?

9. Count by 6's from 0 to 96; from 2 to 98; from 5 to 95.

10. *Add:*

17	7	27	15	29	38	25	33	56
7	7	7	7	7	7	7	7	7

11. Count by 7's from 0 to 98; from 4 to 95.

12. Count by 7's from 2 to 100; from 5 to 96.

13. Go through the addition drill table, page 31.

14. Count by 6's from 1 to 97; from 3 to 99.

15. Find $\frac{1}{2}$ of 24; $\frac{1}{3}$ of 24; $\frac{1}{8}$ of 24; $\frac{1}{6}$ of 24; $\frac{1}{4}$ of 24.

16. Count by 7's from 1 to 99; from 6 to 97.

17. *Add:*

8	8	8	8	8	8	8	8	8
19	27	35	46	92	75	43	54	28

The *fourth* figure in a number, counting toward the *left*, is **thousands'** figure. 9000 = *nine thousand.* 3000 = *three thousand.* 6241 = *six thousand two hundred forty-one.*

1. Read 2128; 4521; 7938; 8000; 8106; 2300; 5840; 6007; 9017; 2307; 8111.

2. Write five thousand; one thousand three hundred sixty-seven; one thousand nine hundred nine; four thousand eight; two thousand ninety-three.

Add up, then down:

3.	*a.* 324	*b.* 142	*c.* 612	*d.* 416	*e.* 423	*f.* 324
	132	353	225	527	576	521
4.	*a.* 351	*b.* 254	*c.* 341	*d.* 649	*e.* 894	*f.* 342
	460	165	205	427	783	643
	243	342	370	583	527	845
5.	*a.* 786	*b.* 483	*c.* 213	*d.* 138	*e.* 923	*f.* 238
	483	547	426	24	761	182
	765	592	325	805	302	302
	293	384	136	41	50	56
6.	*a.* 314	*b.* 517	*c.* 514	*d.* 235	*e.* 216	*f.* 932
	280	281	283	415	31	18
	179	305	107	800	58	271
	250	490	920	70	814	526
	303	235	116	59	76	32

Read the *addends* and the *sums* in the above examples.

1. **100** cents make **one dollar**. We write it **$1.00**.
200 cents make **two dollars**. We write it **$2.00**.
500 cents make **five dollars**. How would you write it?

2. 125 cents make one dollar and 25 cents. We write it $1.25. Seventeen cents is written $.17, 17 ct., or 17¢. 349 cents make three dollars and 49 cents. We write it $3.49. Six cents is written $.06, 6 ct., or 6¢. Two hundred twenty-five cents make how many dollars and cents? How would you write it?

3. Read $4.00; $6.00; $15.00; $25.00; $49.00; $.16.

4. Read $1.25; $2.25; $4.35; $6.23; $17.53; $.08.

5. Read $4.32; $7.50; $8.40; $1.05; $16.10; $.10.

6. Read $27.20; $8.07; $3.01; $2.10; $30.01; $.95.

7. Read $2.52; $1.37; $2.49; $3.65; $4.03; $81.20.

8. Read the numbers in question 7 as cents.

9. Read the numbers in question 4 as cents.

10. $2.43
1.25
6.47
5.81
6.35

Read these addends as cents, then as dollars and cents. Add them and read the sum.

11. *Read and add:*

a.	*b.*	*c.*	*d.*	*e.*
$ 4.23	$ .42	$3.81	$1.86	$2.35
6.87	1.37	.59	2.35	4.16
4.19	.58	.47	4.81	.89
12.15	.69	.33	7.63	5.71
8.52	4.73	4.44	.48	.60

1. James had $.29 and found $.02. He then had —— cents.

2. There were 57 sheep in one field and 5 in another. In both fields there were —— sheep.

3. How many pupils in a class composed of 23 girls and 8 boys?

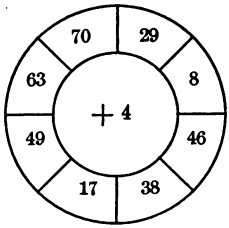
4. A yard of cloth cost 56 cents and a yard of ribbon 9 cents. They both cost —— cents.

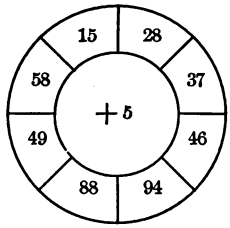
5. William is 18 years old and Frank is 7. The sum of their ages is —— years.

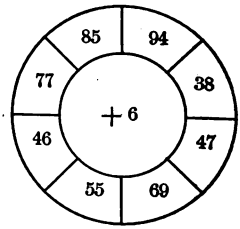
6. Two fours and five threes make how many?

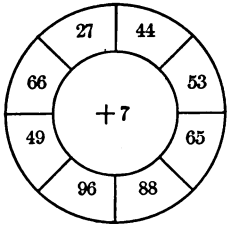
7. *Add:*

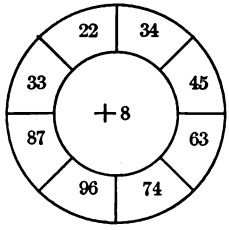
36	49	36	42	38	64	85	39
7	8	5	9	6	9	7	9

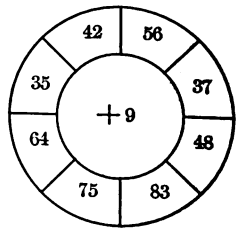












1. There are 26 pupils in one class, 26 in another, and 40 in a third. How many pupils in the three classes?

2. A farmer raised 387 bushels of corn the first year, 293 the second, 468 the third, and 99 the fourth. How many bushels did he raise in the four years?

3. A boat is loaded with 927 bushels of corn, 383 bushels of wheat, 898 bushels of barley, and 629 bushels of oats. How many bushels in the load?

4. During the month of June, the meat for our family cost $7.18, the flour $3.88, the butter $2.79, the sugar $2.18, and the rent $25. What did all of them cost?

5. Our lot is 66 ft. wide and 168 ft. long. Make a picture of it. How far must I go to walk around it?

6. A girl paid 48 cents for stamps and 37 cents for postal cards. What did both cost?

7. *Write and add:*

Seventy-eight cents; two dollars and seventy-nine cents; 16 dollars and eight cents; eighty-three dollars and seven cents; thirty-one dollars and sixteen cents. What are these numbers called? What is the answer called?

8. Henry spent 47 cents for tea, 69 cents for potatoes and 93 cents for apples. How much money did he spend?

9. Shoes for $3.50, a hat for $2.50, a suit of clothes for $17.75, an overcoat for $12.98 and underwear for $6.56 cost in all how much?

10. Sarah had $.89 after buying a 50-cent book and a 25-cent comb. How much had she at first?

1. $7+7+3+8=$——
$6+8+6+2=$——
$5+3+9+5=$——
$8+9+7+7=$——
$+\ +\ +\ =\ ?$

2. $6+5+7+2+6=$——
$5+7+6+9+9=$——
$4+6+8+7+4=$——
$8+8+5+8+3=$——
$+\ +\ +\ +\ =\ ?$

3. $9+6+5+6=$——
$4+7+8+3=$——
$2+5+4+9=$——
$8+4+7+5=$——
$7+7+6+4=$——
$+\ +\ +\ =\ ?$

4. $7+8+9+6+8=$——
$6+9+4+4+7=$——
$9+5+3+5+5=$——
$5+4+1+3+4=$——
$3+3+7+8+8=$——
$+\ +\ +\ +\ =\ ?$

5. $3+6+4+8=$——
$5+2+9+6=$——
$4+3+2+1=$——
$8+6+9+5=$——
$+\ +\ +\ =\ ?$

6. $9+3+8+10+5=$——
$6+4+2+4+8=$——
$7+8+3+9+2=$——
$6+0+5+7+3=$——
$+\ +\ +\ +\ =\ ?$

7. *Add:*

a.	*b.*	*c.*	*d.*	*e.*
783	492	$6.07	$ .96	$12.10
472	18	.49	4.71	3.19
921	96	.63	5.83	.29
687	439	4.07	6.92	17.00
432	897	.21	.88	6.31

8.

a.	*b.*	*c.*	*d.*
$ 4.83	$8.49	$19.07	$ 8.36
.79	6.72	10.50	.48
6.85	.36	.18	.90
12.92	4.07	3.98	4.07
13.07	5.60	7.62	16.00

1. Take 5 from 7; 13; 17; 15; 10; 9; 12; 11; 8.

2. Take 4 from 9; 11; 13; 16; 12; 7; 15; 10; 14.

3. There are 11 seats in a row. Children sit in all but two of them. How many children in the row?

4. Take 3 from 8; 12; 9; 15; 13; 7; 10; 14; 11.

5. Take 7 from 9; 14; 16; 18; 13; 19; 15; 17; 11.

6. May planted 39 rosebushes. Two of them died. How many lived? Picture them in 3 rows.

7. Count by 2's from 49 to 1.

8. Take 11 from 15; 13; 17; 11; 21; 19; 22; 23.

9. Take 2 from 11; 21; 31; 51; 61; 81; 71; 41.

10. Take 2 from 10; 20; 30; 80; 90; 60; 40; 70; 50.

11. John bought some raisins for 12 cents and gave the clerk 2 dimes. How much change should he receive?

12. Take 6 from 12; 14; 18; 9; 11; 17; 15; 16; 10.

13. Take 9 from 12; 10; 13; 15; 17; 18; 21; 19.

14. A half dime and —— cents make 17 cents.

15. Take 12 from 15; 18; 12; 24; 20; 23; 19; 21.

16. Take 10 from 20; 19; 22; 16; 21; 18; 15; 17.

17. Take 8 from 10; 9; 13; 20; 15; 19; 16; 18; 17.

18. Luther and John earned 20 cents shoveling snow. John earned 12 cents. How many cents did Luther earn?

19. $8+7=?$ $15-8=?$ $15-7=?$ $8+?=17$ $7+?=17$

20. $4+?=12$ $?+8=12$ $12-4=?$ $12-8=?$

21. ——$+$——$=18$. ——$+$——$=15$.

22. A foot less 7 inches are how many inches?

1. From 378 take 135.

378	*Minuend*	5 units from 8 units leave 3 units.
135	*Subtrahend*	3 tens from 7 tens leave 4 tens.
243	*Remainder*	1 hundred from 3 hundreds leaves 2 hundreds.

The number from which we subtract is the **minuend.**
The number subtracted is the **subtrahend.**
The result of subtraction is the **difference** or **remainder.**

2. From 948 take 716. Which of these numbers is the minuend? Which is the subtrahend? What shall we call the result?

3. 836	4. 956	5. 507	6. 738	7. 89	8. 938
−423	−25	−203	−607	−26	−817
9. 769	10. 807	11. 486	12. 985	13. 631	14. 639
−553	−503	−375	−474	−420	−317
15. 863	16. 347	17. 450	18. 892	19. 298	20. 847
−751	−216	−320	−660	−162	−516

21. The subtrahend is 342 and the minuend 483. What is the difference?

22. The minuend is 98 and the subtrahend 48. Find the remainder.

23. What is the difference between 837 and 206?

24. How much larger is 984 than 863?

25. What number added to 48 makes 89?

26. A kite string 897 feet long is how much longer than a kite string 492 feet long?

1.

2	5	8	10	7	11	3	12	6	4	9

a. Add 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 to each of the numbers in the squares.

b. Subtract every number in the squares from 14; from 15; from 16; from 17; from 18.

Add:

2.

5	15	25	35	85	75	45	65	55
6	6	6	6	6	6	6	6	6

3.

5	15	35	65	85	75	45	25	55
7	7	7	7	7	7	7	7	7

4.

2	12	32	22	52	72	9	9	9
9	9	9	9	9	9	82	62	42

5.

38	99	28	85	23	92	86	49	52
74	43	95	95	87	88	78	35	71

6. How much farther is 296 miles than 85 miles?

7.

A bushel of apples cost	$ 1.25
A box of oranges cost	4.35
A box of soap cost	3.45
A dozen cans of corn cost	1.44
They all cost	

8. Find the difference between 104 and 507.

9. $ 14.28 − 12.06

10. $ 85.92 − 15.70

11. $ 86.27 − 16.15

12. $ 12.86 − 9.10

1. $\begin{array}{r} 30 \\ -2 \\ \hline 28 \end{array}$ *Difference*

$30 = 20 + 10$

$2 = \quad 2$

$20 + 8 = 28$ *Difference*

2. $\begin{array}{r} 73 \\ -8 \\ \hline 65 \end{array}$ *Difference*

$73 = 60 + 13$

$8 = \quad 8$

$60 + 5 = 65$ *Difference*

3. Subtract 2 from 10; 20; 30; 40; 50; 60; 70; 80.

4. Subtract 3 from 10; 20; 30; 40; 50; 60; 70; 80.

5. Subtract 4, 5, 6, 7, 8, and 9 from the same numbers as those given in question **4**.

6. Subtract 2 from 11, 21, 31, 41, 51, 61, 71, 81, 91.

7. From the same numbers, subtract 3, 4, 5, 6, 7, 8, 9.

8.

12	22	32	42	52	62	72	82	92
−2	−2	−2	−2	−2	−2	−2	−2	−2

9. Subtract 3, 4, 5, 6, 7, 8, and 9 from the minuends given in question **8**.

10.

13	23	33	43	53	63	73	83	93
−3	−3	−3	−3	−3	−3	−3	−3	−3

11. Subtract 4, 5, 6, 7, and 9 from the minuends given in question **10**.

12.

14	24	94	14	24	34	44	54	64	74
−4	−4	−4	−5	−5	−5	−5	−5	−5	−5

13.

84	94	14	24	34	74	84	94	14
−5	−5	−6	−6	−6	−6	−6	−6	−7

1. One ten = how many units?

2. One hundred = how many tens?

3. One thousand = how many hundreds?

4. From 473 take 135.

473 = 4 hundreds + 6 tens + 13 units.
135 = 1 hundred + 3 tens + 5 units.
338 = 3 hundreds + 3 tens + 8 units. *Difference.*

We cannot take 5 from 3. So we take 1 ten out of 7 tens, put it with 3, making 13 units, and subtract 5 units from 13 units. We then take 3 tens from 6 tens, and 1 hundred from 4 hundreds. How do we get 6 tens?

5. From 629 take 237.

629 = 5 hundreds + 12 tens + 9 units.
237 = 2 hundreds + 3 tens + 7 units.
392 = 3 hundreds + 9 tens + 2 units.

Can you tell how this is done? How do we get 12 tens? How do we get 5 hundreds?

6. 981	7. 352	8. 764	9. 662	10. 816	11. 236
−732	−135	−545	−254	−623	−52
12. 149	13. 918	14. 732	15. 608	16. 983	17. 536
−56	−48	−313	−27	−874	−435
18. 439	19. 906	20. 382	21. 641	22. 319	23. 709
−247	−514	−174	−512	−258	−358

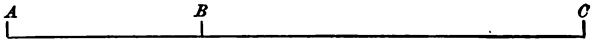
1. From 15, 25, 35, 45, 55, 65, 75, 85, 95, take 6, 7, 8, and 9.

2. Take 7, 8, and 9 from each of the following numbers: 16, 26, 36, 46, 56, 66, 76, 86, and 96.

3.	17	27	37	47	57	67	77	87	97
	−8	−8	−8	−8	−8	−8	−8	−8	−8
4.	17	27	37	47	57	67	77	87	97
	−9	−9	−9	−9	−9	−9	−9	−9	−9
5.	18	28	38	48	58	68	78	88	98
	−9	−9	−9	−9	−9	−9	−9	−9	−9

6. Twenty boys went camping. All but 9 of them caught cold. How many boys caught cold?

7. A mother hen hatched 13 chickens. Only 8 of them lived. How many died?

8. 

If it is 24 miles from *A* to *C*, and 8 miles from *A* to *B*, how far is it from *B* to *C*?

9. Ted rode his bicycle 18 miles from home. He turned about and had ridden 12 miles toward home when his tire burst, so that he had to walk. How far had he to walk? (Picture.)

10. 5 yards are how much more than 9 feet?

11. Anna bought a tablet for 8 cents. If she gave the clerk a quarter of a dollar, how much change should she receive?

1. $18-10=?$ What can you do with 10 and 8 to get 18?

2. What can you do with 12 and 5 to get 7? With 5 and 7 to get 12?

3. $13-?=9$ $9+?=13$ $13\ ?\ 9=4$ $9\ ?\ 4=13$

4. Henry earned \$15. He bought some clothes for \$7 and put the rest of his money in the bank. How much did he put in the bank? How do you find it?

5. If Henry put \$8 in the bank and spent \$7 for clothes, how would you find the number of dollars he had at first?

6. 12, 18, 6. Show all the things that you can do with two of these numbers to get the other.

Written

1. $\begin{array}{r} 467 \\ 325 \\ \hline \end{array}$ Find the remainder. Add the remainder and subtrahend. What do you get? If you should not get the minuend when you add the subtrahend and remainder, what would you think was the reason? Since you do get the minuend by adding the subtrahend and remainder, what does it tell you about the remainder? How can you find out whether any remainder is correct?

In the following examples, find the remainders and test your work by adding the remainder and subtrahend.

2. $\begin{array}{r} 342 \\ -121 \\ \hline \end{array}$ 3. $\begin{array}{r} 987 \\ -603 \\ \hline \end{array}$ 4. $\begin{array}{r} 658 \\ -435 \\ \hline \end{array}$ 5. $\begin{array}{r} 709 \\ -209 \\ \hline \end{array}$ 6. $\begin{array}{r} 917 \\ -615 \\ \hline \end{array}$

7. $\begin{array}{r} \$52.63 \\ -12.91 \\ \hline \end{array}$ 8. $\begin{array}{r} \$82.49 \\ -26.39 \\ \hline \end{array}$ 9. $\begin{array}{r} \$16.81 \\ -7.19 \\ \hline \end{array}$ 10. $\begin{array}{r} \$12.81 \\ -9.35 \\ \hline \end{array}$

Find the remainders and test your work:

1. 763 528	2. 307 164	3. 625 218	4. 658 435	5. 719 217
6. 947 615	7. 456 295	8. 887 479	9. 715 263	10. 984 237
11. \$9.35 2.48	12. \$2.19 1.36	13. \$9.10 3.50	14. \$17.25 9.32	
15. \$59.20 28.30	16. \$49.37 25.66	17. \$81.79 15.63	18. 865 429	
19. \$12.93 5.09	20. \$2.06 1.96	21. \$4.37 .85	22. \$19.28 15.00	

23. Mr. Brown bought a horse for \$245 and sold it for \$190. How much did he lose?

24. Clarence bought a sheep for \$3.75 and sold it for \$5.80. How much did he gain?

25. Six hundred seven pupils are enrolled in our school. Five hundred ninety-three are present. How many are absent?

26. There are 956 men in a parade; 784 of them are on foot. How many are riding?

27. 1296 −473	28. 4381 −2073	29. 981 −973	30. 7120 −500
31. 2013 −1005	32. 408 −231	33. 607 −583	34. 370 −219

1. 9 and 8 are the two parts of ——. 8 is one part of 17; the other part is ——.

2. One part of 25 is 7. What is the other?

3. William earned $.01 on Monday, $.02 on Tuesday, $.03 on Wednesday, and so on through the week. How much did he earn?

4. Tom and Joe caught 23 trout. Joe caught 12 of them. Tom caught ——.

5. Jessie and her mother pared 32 apples. Jessie pared six. Her mother pared ——.

6. A postman had 15 days' vacation. He went away for 8 days. How many days did he stay at home?

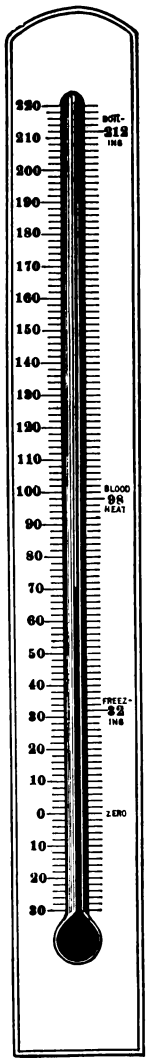
7. Ethel earned two dimes and 2 nickels. In all she earned —— cents.

Written

Add toward the top, then toward the bottom:

1.	2.	3.	4.	5.
621	106	264	563	462
143	342	341	692	153
254	260	173	118	247
326	406	462	209	321
243	347	374	712	145

6.	7.	8.	9.	10.
598	390	635	264	246
321	408	962	324	314
607	761	48	149	270
53	29	307	254	186
908	382	42	326	409



1. The degree of heat that anything has is called its temperature. What is it that measures temperature? When the liquid in the thermometer rises, is it growing warmer or colder? When the liquid goes down?

2. Find zero (0) on this thermometer. What temperature does this thermometer show now?

3. Find the freezing point. That is how many degrees above zero? It is how many degrees below the boiling point?

4. When the thermometer out of doors shows 10 degrees (10°) below zero, what do you think the season is? It is how many degrees below the freezing point? What is the season when it shows 90 degrees (90°) above zero?

5. When it is 49° above zero at sunrise and 18° higher at noon, what is the temperature at noon?

6. When the city water is at 58°, how much must it be heated before it boils? How many degrees must it cool before it freezes?

7. The temperature of the body is 98° above 0. It is how much above the freezing point?

8. Look at the schoolroom thermometer and tell how warm the room is. It is how much cooler than your body?

NOTE. — Many more exercises may be given, using the schoolroom thermometer in various locations.

1. *Subtract and test your work:*

a.	*b.*	*c.*	*d.*
6324	4713	$78.21	$63.92
4516	2804	34.05	44.08

2. Add two hundred nine, five hundred thirty-two, thirty-six, one thousand three hundred twenty-five, and eight hundred ten.

3. Add $564.32, $34.27, $248, $6.03, and $48.27.

4. A tank held 634 gallons of oil. 218 gallons leaked out. How much remained?

5. A grocer sold 539 pounds of coffee and had 756 pounds left. How many pounds had he at first?

6. $465.32 + $234.16 + $72.18 + $8 + $5.01 = ?

7. Separate 506 into two parts, one part being 153.

8. The two parts of a number are 479 and 1088. Find the number.

9. Claude has $5.08 in the school bank, $16.24 in the city savings bank, and $1.38 in his purse. How much money has he?

10. A farmer sold a load of potatoes to a grocer for $23.20. He bought some sugar, tea, and flour for $14.18. How much money should he receive?

11. A man sold a harness for $12.75, receiving for it a load of wood and $7.80. What was the wood worth?

12. *Find the difference between:*

a. 589 and 692.
b. 437 and 928.
c. $52.26 and $16.19.
d. $345.16 and $192.95.
e. 3246 and 8109.
f. 235 and 1047.

1. *Some of the things that we have learned:*

a. —— pints make a quart.

b. There are —— quarts in a gallon.

c. —— inches make 1 foot.

d. One yard is the same as —— feet.

e. One dollar is equal to —— cents.

f. A half dime is —— cents.

g. Ten cents make one ——.

h. The numbers added are ——.

i. The result of addition is the ——.

j. The number from which a number is subtracted is the ——.

k. The remainder or difference is ——.

l. We may test our work in subtraction by ——.

2. A house that is 8 yd. wide is —— feet wide.

3. A cow that gives 12 qt. of milk gives —— gallons.

4. A rule that is 24 inches long is —— feet long.

5. Two dimes and a half dime make —— cents, or one —— of a dollar.

6. Express your age in Roman numerals.

7. There are 24 rosebushes in 3 equal rows; how many in a row? (Picture.)

8. How many oranges at 4 cents apiece can I get for 2 dimes?

9. Harold is 9 years old. How old will he be 8 years from now? 12 years? 16 years? 7 years? 13 years?

10. Count by 8's to 32; by fours; by 2's.

1. A merchant bought 459 yd. of silk, 847 yd. of flannel, 1027 yd. of muslin, 439 yd. of prints, and 2348 yd. of broadcloth. How many yards did he buy?

2. A city has 429 miles of streets. If 238 miles are paved, how many miles are unpaved? Test your work.

3. Add three thousand forty dollars fifteen cents; two hundred twenty-seven dollars fifty-six cents; and ten dollars forty-nine cents.

4. Two men start from the same place; one travels east 983 miles; the other travels west 479 miles. They are then how many miles apart? (Picture.)

5. A man earned $581 in one year, $748 the next, and $857 the next. *a.* How much did he earn in the three years? *b.* If he spent $1479, how much did he save?

6. *Express in Roman numerals:*

a. The number of feet in a yard.
b. The number of quarts in a gallon.
c. The number of feet in 7 yards.
d. The number of inches in a foot.
e. The number of cents in a dime.
f. The difference between 25 and 8.
g. The number of cents in two dimes.
h. Your age.
i. The number of pints in 2 gallons.
j. The number of school days in 3 weeks.

7. Write in figures VI, VIII, IX, XI, XIII, XIV, XVIII, XXII, XIX, XXIV.

1. Eight years from now May will be 20 years old. How old is she now?

2. What coin is $\frac{1}{4}$ of 20 cents? $\frac{1}{2}$ of 20 cents? $\frac{1}{4}$ of a dollar?

3. Nellie had 21 cents and spent $\frac{1}{3}$ of it. *a.* How many cents did she spend? *b.* How many cents has she left?

4. There are 24 hours in one day. How many hours in $\frac{1}{3}$ of a day?

5. Eight 2's less five 3's are how many?

6. Five kittens have how many paws?

7. Six squares have how many corners? Cut them from paper, then fold them into halves and quarters.

8. Kate had 33 peaches and gave away 9. How many had she then?

9. If 3 pounds of dates cost 21 cents, what will one pound cost? What will 2 pounds cost?

10. $12+?=22$ $?+9=21$ $12+11=?$ $10+?=22$

11. Read 5007; 2010; 5080; XIX; XIV; XXIII; XIII; IX.

12. 24 lemons are how many dozen?

13. Make a problem for $7+6$; for 3×6; for $21-11$; for $15\div3$; for 2×7; for $12\div2$; for $10+5$.

14. 2 dozen oranges less 6 are how many?

15. *Add and subtract:*

14	35	49	85	76	27	68	53	93
8	5	3	7	5	3	4	9	7

1. How many 2's in 10? 18? 20? 12? 14? 24? 22?

2. What is $\frac{1}{2}$ of 8? 4? 10? 16? 12? 14? 24? 20?

3. Count by 3's to 24 and back; from 2 to 26 and back.

4. How many 3's in 24, 18, 12, 21, 15, 9, 6?

5. What is $\frac{1}{3}$ of 6? 9? 15? 21? 12? 18? 24?

6. $4+4+4+4+4=?$ How many 4's did you add to get 20? Then 20 is how many 4's? In what other way than by addition can you find five fours?

7. Count by 3's until you have the sum of five 3's.

8. In what other way could you have found the value of five 3's? Which is the shorter way?

9. Find, by addition, seven 4's; eight 4's; nine 4's; ten 4's; eleven 4's; twelve 4's.

10. How many 4's in 40? 28? 36? 44? 16?

11. What is $\frac{1}{4}$ of 24? 12? 16? 44? 36? 28?

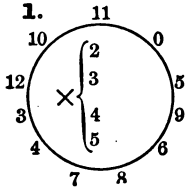
12. How many are three 4's? Five 4's? Ten 4's? Twelve 4's? Nine 4's? Eleven 4's? Eight 4's? Six 4's?

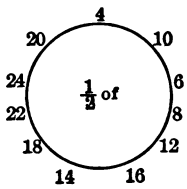
13.
$$\begin{array}{r} 20 \\ -4 \\ \hline 16 \\ -4 \\ \hline 12 \\ -4 \\ \hline 8 \\ -4 \\ \hline 4 \end{array}$$

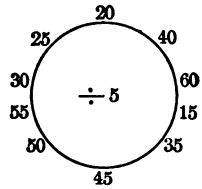
How many 4's are there in 20? How did we find it?

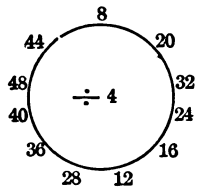
In the same way, find how many 3's there are in 12; 3's in 27; 4's in 32; 5's in 30; 5's in 40; 4's in 48; 5's in 60.

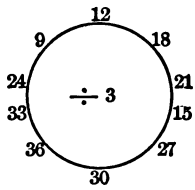
1.

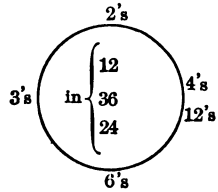












2. What is the cost of twelve 2-cent stamps?

3. Jessie is 9 years old; her brother is twice as old. How old is her brother?

4. How many pints will a 10-quart pail hold?

5. How many pints in a gallon? In 2 gallons? In 3 gallons?

6. *a.* Our schoolroom is 36 feet long. How many yards long is it? *b.* It is 9 yards wide. How many feet wide is it?

7. Five gallons of oil will fill a quart lamp how many times?

8. If 3 lemons will make a pitcherful of lemonade, how many such pitchers of lemonade will a dozen lemons make?

9. Twenty-four eggs are how many dozen? 48 eggs?

10.

5	10	5	6	12	5	5	4	6
×2	×5	×4	×5	×5	×11	×3	×6	×5

1. If one cow costs $42, what will 4 cows cost? Find it by addition.

We may also find it by multiplication, thus:

$42 — 4 times 2 units are 8 units.
4 — 4 times 4 tens are 16 tens, or 1 hundred and 6 tens.
$168 — $168. *Answer.*

Multiply and test your work by addition:

2. 64 × 2	3. 82 × 4	4. 51 × 6	5. 94 × 2	6. 93 × 3
7. 71 × 5	8. 82 × 3	9. 41 × 6	10. 83 × 2	11. 71 × 6
12. 843 × 2	13. 544 × 2	14. 932 × 2	15. 510 × 6	16. 811 × 5
17. 802 cents × 4	18. 601 cents × 5	19. 712 cents × 4	20. 433 cents × 3	
21. 510 cents × 6	22. $8.02 × 4	23. $6.01 × 5	24. $7.12 × 4	

25. If John's coat cost $4.20, what must be paid for 3 such coats?

26. Find the cost of 5 colts at $41 apiece.

27. Find the cost of:

a. Three bushels of apples at 63 cents a bushel.

b. Four pounds of steak at 22 cents a pound.

c. Five baskets of peaches at $1.10 a basket.

d. Two city lots at $940 apiece.

1. 73
4
292

4 times 3 units are 12 units = 1 ten and 2 units.
4 times 7 tens are 28 tens.
28 tens + 1 ten = 29 tens = 2 hundreds and 9 tens.
292. *Answer.*

2. 48 *Multiplicand.*
2 *Multiplier.*
96 *Product.*

The number multiplied is the **multiplicand.**
The number by which we multiply is the **multiplier.**
The result of multiplication is the **product.**

Multiply and test your work by addition:

3. 69	4. 79	5. 65	6. 78	7. 431	8. 243	9. 45
2	2	3	3	4	3	6
10. 82	11. 531	12. 263	13. 984	14. 782	15. 85	16. 873
4	3	3	2	3	3	2
17. $2.83	18. $4.84	19. $3.82	20. $6.51	21. $5.18
2	2	4	5	3
22. $7.19	23. $1.62	24. $5.91	25. $8.09	26. $4.15
3	4	5	4	6
27. $7.19	28. $66.21	29. $2.47	30. $921	31. $450
3	4	2	4	3
32. $17.08	33. $16.05	34. $42.83	35. $34.84
3	4	2	2

36. Read:

a. The multiplier in example 35. *b.* The product in example 32. *c.* The multiplicand in example 25.

1. Add 7 to 4, 8, 9, 5, 17, 16, 2, and 11.

2. Subtract 8 from 14, 24, 34, 44, 54, 64, 74, 84, 94.

3.

24	34	44	54	64	74	84	94	104
−7	−7	−7	−7	−7	−7	−7	−7	−7

4. Subtract 9 from 14, 24, 34, 44, 54, 64, 74, 84, 94.

5.

21	42	73	56	32	71	54	81
−7	−8	−9	−8	−3	−7	−6	−7

6.

33	71	83	96	73	52	42	61
−4	−2	−4	−9	−8	−5	−3	−9

7. $4\overline{)32}$ $5\overline{)25}$ $4\overline{)28}$ $4\overline{)48}$ $3\overline{)21}$ $3\overline{)27}$ $3\overline{)24}$ $2\overline{)24}$

8. $3\overline{)36}$ $5\overline{)45}$ $2\overline{)22}$ $4\overline{)36}$ $4\overline{)40}$ $4\overline{)24}$ $4\overline{)28}$ $7\overline{)28}$

Written

9. 813	10. 493	11. 290	12. 840	13. 237	14. 800
−633	−234	−164	−650	−156	−720
15. 931	16. 815	17. 790	18. 841	19. 126	20. 371
−702	−442	−683	−724	−86	−232

21. *Find the difference between:*

a. 234 and 986. *b.* 642 and 437. *c.* \$29.38 and \$46.91.

d. 834 and 1052. *e.* 293 and 86. *f.* 6428 and 9275.

1. XXV = 20 + 5 = 25. XXVI = 20 + 6 = 26. XXVIII = 20 + 8 = ?

2. XXIX = 20 + 9 = 29. XXX = 10 + 10 + 10 = ? XXXI = 31. XXXII = ?

3. XXXIII = 30 + 3 = 33. XXXIV = 30 + 4 = 34. XXXV = ?

4. XXXVI = 30 + 6 = 36. XXXVII = 30 + 7 = ? XXXVIII = ?

5. 39 = 30 + 9. Write it in Roman.

6. L = 50. LI = 51. LIV = 50 + 4 = ?

7. Write 55 in Roman. Write 56, 57, 58, 59.

8. XL = 50 − 10 = ? XLI = 40 + 1 = ? XLII = ?

9. Write in Roman 43, 44, 45, 46, 47, 48, 49.

10. LX = 50 + 10 = ? LXV = ? Write 66, 68, 69.

11. LXX = 50 + 20 = ? Write 72, 74, 75, 76, 78, 79.

12. LXXX = 50 + 30 = ? Write 81, 83, 84, 86, 87, 89.

13. C = 100. XC = 100 − 10 = 90. XCII = 90 + 2 = ?

14. Write 93, 94, 95, 96, 97, 98, 99.

Read the following examples in class.

Copy them in figures and find the products.

15. XXVIII × IV 16. XIX × III 17. XL × V

18. LV × IV 19. LXV × III 20. XLIV × VI

21. LXXVIII × III 22. XCVII × II 23. XCIV × IV

24. LXXXIX × III 25. XLIX × II 26. LIX × V

27. A set of books consists of 3 volumes. Each volume contains LXXXV chapters. How many chapters in all the volumes?

1. A farmer raised 864 bushels of oats and sold half of them. How many bushels did he sell?

432 bushels — $\frac{1}{2}$ of 8 hundreds = 4 hundreds.
2)864 bushels — $\frac{1}{2}$ of 6 tens = 3 tens.
$\frac{1}{2}$ of 4 units = 2 units. 432 bushels. *Answer.*

2. $2\overline{)426}$ 3. $2\overline{)284}$ 4. $2\overline{)648}$ 5. $2\overline{)886}$ 6. $3\overline{)936}$

7. $3\overline{)630}$ 8. $4\overline{)884}$ 9. $4\overline{)408}$ 10. $5\overline{)550}$ 11. $6\overline{)606}$

12. $\frac{1}{2}$ of 660 = ? 13. $\frac{1}{3}$ of 933 = ? 14. $\frac{1}{4}$ of 840 = ?

Dividend *Divisor* *Quotient*

15. 682 divided by 2 = ——

The number divided is the **dividend.**
The number by which we divide is the **divisor.**
The result of division is the **quotient.**

Find the quotients:

	Dividend	Divisor		Dividend	Divisor
16.	480	4	18.	336	3
17.	606	6	19.	505	5

20. A farmer brought 248 eggs to market. $\frac{1}{4}$ of them were broken. How many eggs were broken?

21. Two hundred sixty-six pupils attend a certain school. There are just as many boys as girls. How many boys are there? How many girls?

	cents		cents		cents
22.	$4\overline{)448}$ cents	26.	$3\overline{)933}$ cents	30.	$2\overline{)228}$ cents
23.	$4\overline{)\$4.48}$	27.	$3\overline{)\$9.33}$	31.	$2\overline{)\$2.28}$
24.	$8446 \div 2$	28.	$6060 \div 3$	32.	$6060 \div 6$
25.	$\$5.50 \div 5$	29.	$\$6.93 \div 3$	33.	$\$24.88 \div 2$

1. One orange for 5¢, a lemon for 2¢, and a pineapple for 15¢ cost how much? (Picture.)

2. 11 ft. is how much more than 3 yd.?

3. Three quarts more than 4 gal. are how many quarts?

4. 30 boys are arranged in 5 equal lines. How many boys in each line? (Picture.)

5. If 1 man can build a wall in 27 days, in how many days ought 3 men to build it?

6. In 4 weeks there are how many school days?

7. How many weeks in 21 days?

8. $40+20=?$ $50+30=?$ $16+12=?$ $57+9=?$

9. $\frac{1}{6}$ of 24 cents are how many cents?

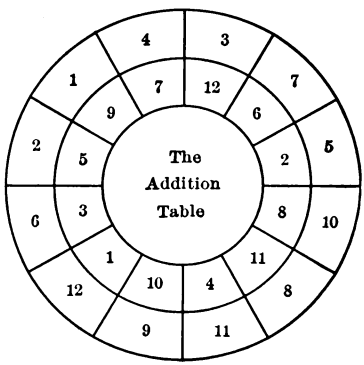
10. Add 2, 3, 4, 5, and 6 to 14, 25, 36, 47, and 58.

11. Add 6, 7, 8, and 9 to 14, 25, 36, 47, 58, and 69.

12. Add 5, 6, 7, 8, and 9 to 16, 38, 57, 89, and 65.

13. Count by 6's from 0 to 72.

14. One pint more than 12 qt. is how many pt.?



Add each of the numbers in the outer ring to every number in the inner ring.

1. $369 + 483 + 754 + 96 + 9 = ?$

2. $432 \times 2 = ?$ $561 \times 2 = ?$ $823 \times 3 = ?$ $483 \times 3 = ?$

3. There are 144 pencils in a gross. How many are there in 2 gross?

4. Lucy divided 486 beads equally between Mabel and Sarah. How many did Mabel receive? Sarah?

5. *a.* Some of our expenses for a year are:

Food	$462.23
Clothing	154.35
Doctor and Medicine	48.54
Taxes	61.08
Books and Papers	28.40
Fuel and Light	68.39
Total	

b. If our income is $1292.50, how much have we left?

c. How much is our income for 3 years?

d. What are these expenses for 2 years?

6. Albert has collected 191 postage stamps. Ralph has 5 times as many. How many has Ralph?

7. $237 + ? = 543$. $543 - ? = 237$. $306 + ? = 543$.

8. How many quarts in 862 gallons?

9. How many quarts in 862 pints?

10. How many pints in 232 gallons?

11. Find by addition twelve 5's; seven 4's; twelve 3's; four 8's; five 10's; four 11's; eleven 4's.

12. Find by subtraction how many 4's in 48; 7's in 35; 5's in 35; 4's in 32; 8's in 32; 11's in 44; 4's in 44.

13. Write the table of 2's to 2×12.

14. Write the table of 3's. 15. Write the table of 4's.

16. Write the table of 5's.

1. Add five 6's; add six 6's; add seven 6's; eight 6's; nine 6's; ten 6's; eleven 6's; twelve 6's. Learn the sums, and recite them, thus: Six 6's are ——-, etc.

2. How many 6's in 30? How many 5's in 30? $30 \div 6 = ?$ $30 \div 5 = ?$

3. $30 = 6 \times$ ——; $30 = 5 \times$ ——; $7 \times 6 =$ ——; $42 \div 6 =$ ——; $42 \div 7 =$ ——.

4. How many 6's in 42? How many 7's in 42?

5. —— $= 6 \times 9$; $54 \div 6 =$ ——; $54 \div 9 =$ ——.

6. How many 6's in 54? How many 9's in 54? $\frac{1}{6}$ of $54 = ?$ $\frac{1}{9}$ of $54 = ?$

7. Eight 6's are ——; 6 eights are ——; $\frac{1}{6}$ of 48 = ——; $\frac{1}{8}$ of $48 =$ ——; $6 \times$ —— $= 48$; $8 \times$ —— $= 48$; there are —— 6's in 48; there are —— 8's in 48.

8. How many 6's in 60? How many 10's? $\frac{1}{6}$ of $60 = ?$ $\frac{1}{10}$ of $60 = ?$

9. There are 6 arithmetics in a package. How many arithmetics in 7 such packages? In 5, 6, 8, 10, 9 such packages?

10. If Arthur can walk 6 miles in a day, in how many days can he walk 24 miles? 36 miles? 42 miles?

11. 60 is how many 6's? What must we add to 60 to get eleven 6's? Twelve 6's?

12. $6 \times 11 =$ ——; $12 \times 6 =$ ——; $72 \div 6 =$ ——; $72 \div 12 =$ ——; $\frac{1}{6}$ of $72 =$ ——; $\frac{1}{11}$ of $66 =$ ——; $6 \times$ —— $= 66$; —— $\times 12 = 72$; $11 \times$ —— $= 66$.

13. Write the table of 6's through 6×12.

1. 438
6
2628

6 times 8 units = 48 units = 4 tens + 8 units.
6 times 3 tens = 18 tens.
18 tens + 4 tens = 22 tens = 2 hundreds + 2 tens.
6 times 4 hundreds = 24 hundreds.
24 hundreds + 2 hundreds = 26 hundreds = 2 thousands + 6 hundreds. 2628 Product.

Find products and test your work by addition:

2.	341×6.	10.	376×6.	18.	$\$8.90 \times 4$.
3.	79×6.	11.	207×6.	19.	$\$359.87 \times 6$.
4.	88×6.	12.	$\$18.06 \times 6$.	20.	385×6.
5.	72×6.	13.	$\$15.21 \times 6$.	21.	706×6.
6.	537×6.	14.	$\$14.06 \times 5$.	22.	395×6.
7.	169×6.	15.	$\$.79 \times 4$.	23.	617×6.
8.	635×6.	16.	$\$.93 \times 6$.	24.	534×6.
9.	249×6.	17.	$\$2.18 \times 5$.	25.	729×6.

26. Six rows of peach trees, 58 in a row, are how many trees?

27. 219 tons of coal at \$6 a ton cost how much?

28. Find 4 times 763 by addition; by multiplication.

29.	*a.* 653	*b.* 462	*c.* 325	*d.* 433	*e.* 529
	3	4	5	4	6
30.	*a.* 453	*b.* 632	*c.* 725	*d.* 634	*e.* 426
	4	3	5	4	3
31.	*a.* 405	*b.* 327	*c.* 309	*d.* 630	*e.* 743
	6	4	3	6	5

32. How many working days in 349 weeks?

1. Find in two ways the value of seven 7's; eight 7's; nine 7's; ten 7's.

2. $7 \times 9 =$ ——; $7 \times 7 =$ ——; $7 \times 10 =$ ——.

3. 35 is the product of what two numbers? 56? 63? 70? 42? 49? 28? 21? 14?

4. $\frac{1}{7}$ of 70 = ——; $\frac{1}{7}$ of 49 = ——; $\frac{1}{7}$ of 63 = ——; $\frac{1}{7}$ of 28 = ——; $\frac{1}{7}$ of 35 = ——; $\frac{1}{7}$ of 56 = ——.

5. $7 \times 11 =$? How did you find it? $7 \times 12 =$?

6. 8 is $\frac{1}{7}$ of what? 9? 11? 6? 7? 12? 5? 4?

7. How many 7's are there in 21? 35? 49? 70? 84? 63? 77? 56? 42? 28?

8. A schoolroom has 7 rows of desks with 8 in a row. How many desks in all? (Picture.)

9. If there were 42 desks in 6 rows, how many would there be in a row? (Picture.)

10. Seven boys gathered 49 qt. of nuts and shared them equally. How many quarts were there for each boy?

Written

1. *Multiply by* 7: *a.* 32. *b.* 45. *c.* 67. *d.* 53. *e.* 86. *f.* 95. *g.* 123. *h.* 84. *i.* \$42.90. *j.* \$13.28. *k.* \$.99. *l.* 548 pints. *m.* 764 yards. *n.* 196 feet.

2. Multiply 841: *a.* by 3; *b.* by 4; *c.* by 5; *d.* by 6.

3. Multiply \$29.12: *a.* by 5; *b.* by 6; *c.* by 7.

4. Multiply \$4.09: *a.* by 3; *b.* by 4; *c.* by 7.

5. How many days in 98 weeks?

6. If a man earns \$725 a year, how much will he earn in 7 years?

1. The *multiplicand* and *multiplier* are **factors** of the *product.* In $7 \times 9 = 63$, which number is the product? Which are factors?

2. Name two factors of 21; 28; 15; 42; 63; 56; 44; 55; 77; 32; 40; 72; 49; 48.

3. $4 \times \text{——} = 36$; $5 \times \text{——} = 60$; $4 \times \text{——} = 44$.

4. 7 is a factor of 35. What is another factor?

5. *Answer the following without writing either question or answer:*

42×2	56×2	81×4	92×5	321×2
421×3	$32 \div 2$	$93 \div 3$	$408 \div 4$	$609 \div 6$

6. Count by 8's from 0 to 96 and back.

7. Find eight 8's by addition. Name 2 factors of 64.

8. Add 8 to 64. How many 8's in 72? $8 \times ? = 72$.

9. $8 \times 10 = ?$ $8 \times 11 = ?$ $8 \times 12 = ?$ $8 \times ? = 80$.

10. 8 and 12 are factors of what number? 8 and 10? 8 and 11? 8 and 7? 8 and 9? 8 and 6? 8 and 5?

11. When a product and one of its factors are given, how can you find the other factor?

12. $9 \times 8 = ?$ $9 \times 9 = ?$ $9 \times 10 = ?$ $9 \times 11 = ?$ $9 \times 12 = ?$

13. How many 9's are there in 36? 54? 45? 63? 81?

14. How many 9's in 72? 108? 90? 99?

15. Give the multiplication table of 9's; of 8's; of 7's; of 6's; of 5's; of 4's; of 3's; of 2's.

16. Give the missing factor:

$108 = 9 \times \text{——}$; $81 = 9 \times \text{——}$; $63 = 9 \times \text{——}$.

Quart Peck Bushel

NOTE. — These measures should be before the class and used by the pupils. Sawdust, oats, or any other light, dry material may be used to advantage.

1. Which measure is largest?

2. Which is next? 3. Which is the smallest?

4. How many times do you think a bushel of oats would fill the peck measure? Try it and see.

5. How many quarts do you think would be needed to fill the peck measure? Try it and see.

6. How many quarts make a peck? How many pecks make a bushel?

7. Name some things that are measured with these measures.

8. *bu.* stands for bushel, *pk.* for peck, and *qt.* for quart. The dry quart is a little larger than the liquid quart. A half peck is how many dry quarts? How does it compare with a gallon?

9. Find the number of quarts in *a.* 53 pk.; *b.* 49 pk.; *c.* 85 pk.; *d.* 136 pk.; *e.* 841 pk.; *f.* 79 pk.; *g.* 257 pk.

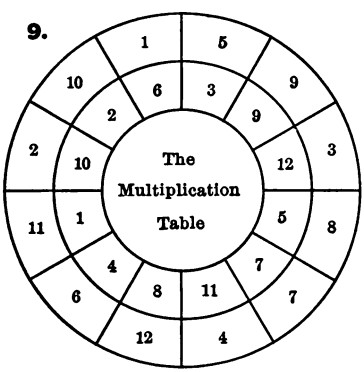
10. Find the number of pecks in *a.* 908 bu.; *b.* 568 bu.; *c.* 912 bu.; *d.* 846 bu.; *e.* 932 bu.; *f.* 711 bu.; *g.* 894 bu.

1. Count by 7's to 84; by 8's to 96; by 9's to 108.
2. What two factors make 36? 44? 55? 48? 64? 72?
3. The product of two numbers is 84. One of them is 7. What is the other?
4. A two-bushel bag will hold how many pecks?
5. 36 pecks of apples will fill how many bushel crates?
6. A quart is what part of a peck?
7. What will a peck of berries cost at 12¢ a quart?
8. *Answer at sight:*

$2\overline{)486}$ $3\overline{)933}$ $4\overline{)880}$ $5\overline{)105}$ $6\overline{)660}$

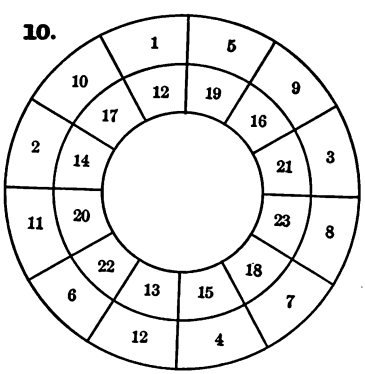
986	323	249	86	405	422	622
−475	+921	+120	−24	×4	×3	×3

9.



Multiply every number in the outer ring by each number in the inner ring.

10.



Subtract each number in the outer ring from every number in the inner ring.

1. *See how quickly you can get these:*

a.	*b.*	*c.*	*d.*	*e.*
169	980	\$4.07	691	396 pk.
×6	×7	×8	−384	×8

2. *a.* If a sleeping car is 69 ft. long, how long is a train of 9 such cars? *b.* If the engine and tender are 57 ft. long, what is the entire length of the train?

3. Seven coal trains have 47 cars in each train. *a.* How many cars in all? *b.* If each car carries 9 tons of coal, how many tons are carried by all the cars?

4. Copy this diagram. Wherever a column and a line cross each other, write the product of the numbers given at the top of the column and at the left of the line, as, $10 \times 8 = 80$; $4 \times 5 = 20$.

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5				20								
6												
7												
8												
9												
10								80				
11												
12												

1. How many 2's in 5, and how many over? In 7? In 11? In 19?

2. How many 3's in 8, and how many over? In 11? In 16? In 14? In 22?

3. How many 4's in 23, and how many over? In 33? In 15? In 21? In 38?

4. In 47 there are —— 5's and —— over. Recite in the same way about 16; 23; 39; 18; 46; 33; 64; 57.

5. Tell how many 9's and how many over in 11; 46; 87; 39; 43; 86; 98; 53; 69; 76; 49; 108; 32.

The number left over when the dividend does not exactly contain the divisor is called the **remainder.**

Dividend		*Divisor*		*Quotient*		*Remainder*	
26	÷	6	=	4	and	2	over
Test:		6	×	4	+	2 = 26	Dividend.

6. *Divide each of the following numbers by* 2, 3, 4, 5, 6, 7, 8, *and* 9, *and test your answers as above:*

7	12	14	38	23	30	19	13	11	17	28
34	32	29	15	10	8	24	31	26	39	35

7. *Divide each of the following numbers by* 5, 6, 7, 8, *and* 9, *and test your answers:*

44	40	52	49	55	42	46	50	59	61	41
51	43	45	53	57	60	48	56	47	54	58

8. *Divide each of the following numbers by* 7, 8, *and* 9, *and test your answers:*

62	72	75	67	65	70	73	74	66	63	76
71	68	64	81	79	82	78	80	77	69	83

1. 64 *Quotient*
$8\overline{)512}$

PROCESS

48 tens
32 units

5 hundreds does not contain 8 any hundred times; 5 hundreds and 1 ten make 51 tens; 51 tens divided by 8 equals 6 tens and 3 tens over; 3 tens and 2 units make 32 units. 32 divided by 8 = 4. 64 *Quotient.*

The figures and words below the dividend may be omitted, and the work expressed thus $8\overline{)512}$ 64 *Quotient* or $8\overline{)512}$ 64 *Quotient*

2. Find $\frac{1}{3}$ of 81; 168; 261; 195; 294; 1488; 1971. How can you test your work? The quotient and divisor are what of the dividend?

3. Find the number of gallons in 236 qt.; 148 qt.; 112 qt.; 244 qt.; 216 qt.; 944 qt.; 2324 qt.

4. How many school weeks in 165 school days? 245 school days? 445 school days? 625 school days?

5. Lucy's father worked 348 days. How many weeks did he work?

6. *a.* $4\overline{)232}$ *b.* $3\overline{)441}$ *c.* $4\overline{)652}$
d. $5\overline{)335}$ *e.* $5\overline{)2410}$ *f.* $3\overline{)720}$

Find the quotients and test your work by multiplication:

7. $\frac{1}{3}$ of 39; of 51; of 57; of 69; of 72; of 102.
8. $\frac{1}{4}$ of 56; of 72; of 84; of 92; of 112.
9. $\frac{1}{5}$ of 65; of 80; of 95; of 140; of 145.
10. $\frac{1}{6}$ of 78; of 102; of 120; of 168.
11. $\frac{1}{7}$ of 91; of 119; of 133; of 175; of 189.
12. $\frac{1}{4}$ of 104; of 136; of 152; of 184; of 200.
13. $\frac{1}{2}$ of 298; of 9312; of 7352; of 3578.

1. *Divide each of these numbers by* 3:
36; 24; 15; 18; 9; 21; 27; 6; 24; 39; 42.

2. *Divide each of these numbers by* 4:
36; 24; 16; 40; 20; 32; 8; 44; 48; 28; 52.

3. *Divide each of these numbers by* 5:
20; 25; 45; 50; 35; 60; 40; 30; 55; 65.

4. *Divide each of these numbers by* 6:
48; 24; 54; 12; 42; 18; 72; 60; 30; 66; 120.

5. *Divide each of these numbers by* 7:
21; 14; 84; 70; 56; 35; 77; 28; 42; 49; 98.

6. *Divide each of these numbers by* 8:
32; 48; 80; 56; 64; 24; 96; 88; 40; 72; 144.

7. *Divide each of these numbers by* 9:
81; 72; 54; 45; 18; 36; 90; 108; 63; 135.

8. A bushel of cranberries cost $2.52. What was the cost of a peck? ($\frac{1}{4}$ of 252 cents.)

9. Give two factors whose product is 12; 8; 24; 18; 21; 36; 42; 84; 108; 72; 81; 56; 63; 54; 42; 32; 16.

10. Find by addition and by multiplication: three 7's; four 8's; five 5's; three 12's; three 11's; six 12's.

11. A table has 4 sides, each 4 ft. long. How far is it around the table? (Picture.)

12.

2	3	5	8	7	10	6	9	4	12	1	11
11	6	2	10	3	1	4	7	12	9	5	8

Multiply each number in the upper row by every number in the lower row.

1. $3\overline{)552}$	2. $4\overline{)164}$	3. $6\overline{)738}$	4. $3\overline{)222}$	5. $8\overline{)336}$
6. $5\overline{)400}$	7. $6\overline{)336}$	8. $5\overline{)785}$	9. $7\overline{)287}$	10. $5\overline{)670}$
11. $4\overline{)816}$	12. $6\overline{)378}$	13. $7\overline{)245}$	14. $3\overline{)267}$	15. $8\overline{)432}$
16. $5\overline{)575}$	17. $4\overline{)356}$	18. $5\overline{)635}$	19. $5\overline{)490}$	20. $6\overline{)804}$

21. Four boys bought a boat for $140. What should each pay?

22. 185 books were put on 5 shelves. How many was that for each shelf?

23. A room has 7 rows of chairs with 19 chairs in each row. How many chairs in the room? (Picture.)

24. *Multiply each of these numbers by* 3:
28; 65; 47; 124; 253; 769; 483; 204; 910.

25. *Multiply each of these numbers by* 4:
49; 385; 769; 428; 349; 206; 908; 839.

26. *Multiply each of these numbers by* 5:
563; 721; 432; 86; 742; 938; 701; 650.

27. *Multiply each of these numbers by* 6:
432; 591; 763; 284; 315; 91; 38; 409; 840.

28. *Multiply each of these numbers by* 7:
63; 40; 51; 48; 39; 415; 521; 230; 408; 916.

29. *Multiply each of these numbers by* 8:
41; 13; 76; 83; 44; 26; 715; 403; 847; 936.

30. *Multiply each of these numbers by* 9:
17; 21; 42; 35; 40; 56; 123; 235; 368; 987.

31. *Divide by* 7 *and test your work:*
105; 133; 154; 217; 392; 469; 595; 651; 623.

1. Count to 80 by 5's; 6's; 7's; 8's; 9's; 10's; 11's.

2. Four books at $.08 apiece cost how much?

3. $.20 for 4 oranges is how much apiece?

4. A half dollar, 2 quarters, a dime, and 2 nickels are how much money?

5. *a.* How much will I have left out of $32 after buying a coat for $11? *b.* 64 quarts = how many pecks?

6. 4 dolls at $.15 apiece cost how much?

7. 28 eggs sold out of 4 dozen leave how many?

8. 3 dimes will buy how many bananas at 3¢ apiece?

9. Bananas at $.48 a dozen are how much apiece?

10. From a rope 24 ft. long, Joe cut 8 ft. for a jumping rope and 7 ft. for hammock ropes. How many feet were cut off? How many feet were left? How many inches long was the jumping rope? The piece that was left?

11. If mother needs 2 dozen buttons for Grace's dress and has 17 buttons, how many must she buy?

Written

1. *a.* Subtract 723 from 1213. *b.* Subtract 24 from $\frac{1}{3}$ of 96.

2. Add $4.20, $3.24, $2.16, $.21, and $2.43.

3. One factor of 168 is 6. What is the other?

4. 29 and 5 are the factors of what number?

5. *See how quickly you can get the answers to these:*

a. $232 + 467 + 229$.

b. $306 + 184 - 200$.

c.
$$\begin{array}{r} \$36.45 \\ -\ 14.29 \\ \hline \end{array}$$

d.
$$\begin{array}{r} 672 \\ -\ 280 \\ \hline \end{array}$$

e. $4\overline{)96}$

f. $5\overline{)365}$

1. *Multiply each of these numbers by* 7, 8, 9, *and* 10:
   a. 37; 36; 31; 35; 34; 33; 32; 38; 39.
   b. 63; 65; 64; 62; 67; 68; 61; 69; 66.
   c. 84; 82; 85; 89; 86; 83; 81; 88; 87; 80.
   d. 93; 94; 95; 96; 92; 97; 99; 98; 91.
2. Find $\frac{1}{8}$ of 104; 120; 136; 152; 168; 184; 200.
3. Find $\frac{1}{9}$ of 117; 135; 153; 171; 189; 207; 225.

Find quotients and remainders. Test your work.

4. *Divide by* 3: 41; 43; 46; 49; 53; 56; 79; 94.
5. *Divide by* 4: 53; 58; 62; 70; 74; 98; 106; 138.
6. *Divide by* 5: 78; 83; 94; 102; 112; 118; 123.
7. *Divide by* 6: 81; 88; 93; 99; 165; 110; 136.
8. *Divide by* 7: 95; 99; 107; 115; 120; 129; 145.
9. *Divide by* 8: 108; 115; 124; 138; 147; 165.
10. *Divide by* 9: 121; 128; 138; 156; 167; 187.
11. Lewis's hens laid 154 eggs in a week. That was how many eggs a day?
12. Copy in figures and find the product: LXVIII × IX.
13. Find the cost of 9 carriages at $257 apiece.
14. At how much apiece must 8 cows be sold to bring $368?
15. Copy in figures and find the quotient: XCVI ÷ IV.
16. How many weeks in 161 days; 245 days; 448 days; 623 days; 497 days; 945 days?
17. $8\overline{)232}$ $9\overline{)441}$ $7\overline{)651}$ $5\overline{)335}$ $5\overline{)2410}$ $9\overline{)1107}$
18. 426 is: *a.* $\frac{1}{7}$ of what number? *b.* $\frac{1}{8}$ of what?

1. $8+3+2+5+7+6-8=?$ $4+8+9-6+10=?$

2. Lewis bought a pencil for 3 cents and a writing pad for 8 cents. How much change should he get from a quarter?

3. In a flock of 57 sheep 9 died. How many lived?

4. Give two factors which make 81; 64; 49; 36; 56; 63; 72; 96; 84; 48; 77; 99; 144.

5. One factor of 121 is 11. What is the other?

6. Write in Roman the numbers of the chapters in a book from Chapter XXXVIII to Chapter LX.

7. Two peaches at 2¢ apiece and 5 oranges at 3¢ apiece cost how much?

8. *a.* $3+9+5-4-2+9=?$ *b.* $4\times9+3=?$ *c.* $6\times8\div12=?$

9. How many months in 11 years?

10. Make a problem for 8×7; for 6×5; for 4×12.

11. $9\times12=$ ——. Make a problem.

12. A half-peck of chestnuts at 5¢ a quart cost how much?

13. 12 bu. of oats will feed how many horses if each horse eats a peck?

14. *a.* 1 gal. = —— pt.; *b.* 1 yd. = —— in.; *c.* 1 bu. = —— qt.

15. If we sing 7 exercises every day, how many shall we sing in a week?

16. The sum of two numbers is 24. One of them is 6. What is the other?

1. *Add. Write sums only. Do not copy the addends. Can you get correct sums in* 3 *minutes?*

a.	*b.*	*c.*	*d.*	*e.*
749	476	754	$128.04	1271
83	584	326	36.12	564
365	693	473	17.49	329
872	227	538	216.20	613
574	456	842	538.52	706
633	843	695	6.37	473
497	709	972	49.59	856

2. *From* 8293 *take*

a. 467; *b.* 548; *c.* 2439; *d.* 7584; *e.* 3965; *f.* 684.

3. *a.* 714×8 *b.* 1264×7 *c.* 207×9 *d.* 273×9 *e.* 807×8 *f.* 561×7

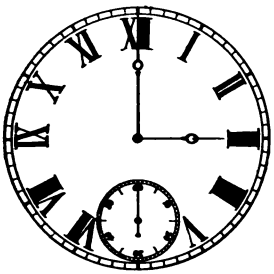
4. *a.* $7\overline{)317}$ *b.* $8\overline{)268}$ *c.* $9\overline{)288}$ *d.* $6\overline{)2454}$ *e.* $5\overline{)170}$

5. *a.* $5\overline{)6700}$ *b.* $4\overline{)196}$ *c.* $7\overline{)658}$ *d.* $9\overline{)1683}$ *e.* $8\overline{)1184}$

6. Three ranchmen own 3978 sheep. If their shares are alike, how many sheep does each man own?

7. A peddler's sales for a week are: Monday, $6.18; Tuesday, $4.23; Wednesday, $7; Thursday, $16.85; Friday, $3.98; Saturday, $27.39. *a.* Find the total for the week. *b.* At the same rate, what would be the total for 9 weeks? *c.* For 7 weeks? *d.* For 8 weeks?

8. Mr. Jones raised 583 bu. of corn, which was 276 bu. more than Mr. Brown raised. How many bushels did Mr. Brown raise?



1. Which is the hour hand? Which is the minute hand? What is the other hand? To what number does the hour hand point? The minute hand? How many hour spaces are there on the dial? How many hours is it from noon to mid night? From midnight to noon? How many hours in a whole day?

2. How long does it take the minute hand to go around the dial? How many minute spaces between XII and I? Between X and XI? How many minute spaces on the whole dial? How many minutes make an hour?

3. How many times will the minute hand pass around the dial between 12 o'clock and 1 o'clock? Between 12 and 4? Between 2 and 5? Between 4 and 9?

How many minutes are there in 2 hours? In 7 hours?

4. The second hand passes around the circle once every minute. How many seconds make a minute?

5. What time is shown on the dial?

6. When the minute hand reaches VI, where will the hour hand be? What time will it be? When the minute hand reaches I, what time will it be? When it reaches II; III; IIII; V; VI; VII; VIII; IX; X; XI; XII?

7. When the hour hand is after V and the minute hand is at III, what is the time? (Picture.)

Summary

—— seconds (sec.) make 1 ——
—— minutes (min.) make 1 ——
—— hours (hr.) make 1 —— (da.)

READING AND WRITING NUMBERS

467,507 is read *four hundred sixty-seven thousand five hundred seven.*

10,450 is read *ten thousand four hundred fifty.*

1. *Read:*

512,239	42,000	639,010
759,283	354,000	420,216
569,351	20,514	25,004
306,429	1,006	106,000
26,381	150,213	70,016
10,450	40,208	236,700

2. *Write:* *a.* One thousand five hundred seventy-four.
b. Two hundred thirty-four thousand six hundred ninety-seven.
c. Fifty-nine thousand.
d. Sixty thousand four hundred thirty.

3. Make a watch dial showing half-past ten.

4. Write in Roman the number of hours in a day; seconds in a minute; hours in half a day; minutes in half an hour; minutes in a quarter of an hour; hours in two days; hours from 5 in the morning to 7 at night.

1. $20+10$	**2.** $40+20$	**3.** $20+70$	**4.** $40+50$
$30+10$	$40+30$	$20+80$	$60+40$
$20+20$	$50+20$	$20+90$	$70+40$
$30+30$	$60+20$	$50+30$	$50+80$
$30+20$	$70+10$	$30+60$	$90+60$
5. $70-20$	**6.** $80-40$	**7.** $60-40$	**8.** $50-30$
$90-10$	$90-30$	$70-50$	$70-60$
$50-20$	$70-10$	$30-20$	$90-40$
$30-10$	$60-20$	$80-50$	$70-40$
$60-30$	$90-80$	$90-60$	$80-20$
9. 10×8	**10.** 30×4	**11.** 50×7	**12.** 6×20
20×2	50×3	60×8	3×80
60×3	70×3	30×6	5×90
40×5	60×2	40×9	2×60
70×2	90×4	80×2	7×30
13. $25+10$	**14.** $16+40$	**15.** $39+10$	**16.** $76+20$
$45+20$	$27+30$	$84+10$	$24+50$
$35+30$	$58+20$	$21+30$	$19+80$
$65+10$	$85+10$	$35+20$	$72+20$
$35+20$	$17+40$	$42+30$	$61+30$
17. $26-10$	**18.** $73-50$	**19.** $89-50$	**20.** $83-50$
$42-10$	$84-20$	$72-40$	$79-20$
$83-20$	$96-30$	$99-70$	$92-80$
$56-30$	$88-50$	$83-40$	$61-30$
$27-10$	$79-60$	$64-50$	$82-60$
7×90	8×40	6×70	2×80

1. *Add* 2, 3, 4, 5, 6, 7, 8, 9 *to each of the following numbers:*

a.	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*	*h.*	*i.*
57	19	55	72	74	58	26	77	82
44	69	98	42	35	68	37	56	53
52	74	75	83	54	38	49	89	62
64	15	66	46	17	36	28	48	96
85	105	63	88	87	73	16	92	93
59	18	47	76	39	45	67	78	27
86	29	99	84	65	95	79	25	97

2. *Subtract* 2, 3, 4, 5, 6, 7, 8, 9 *from each of the above numbers.*

3. Pupils by turn add columns aloud, one pupil writing the sums on the blackboard.

4. $65+27=?$ Say 65, 85, 92.
$65+20=85.$
$85+\ 7=92.$ *Ans.*

In the same way give the sums of the following:

5. $24+25.$ 9. $37+58.$ 13. $64+27.$ 17. $63+29.$
6. $38+43.$ 10. $23+34.$ 14. $81+19.$ 18. $34+38.$
7. $72+19.$ 11. $58+45.$ 15. $59+21.$ 19. $33+68.$
8. $85+16.$ 12. $43+59.$ 16. $58+34.$ 20. $92+19.$

21. $65-27=?$ Say 65, 45, 38.
$65-20=45.$
$45-\ 7=38.$ *Ans.*

22. $72-19.$ 25. $76-29.$ 28. $82-44.$ 31. $45-18.$
23. $85-16.$ 26. $93-37.$ 29. $91-23.$ 32. $37-19.$
24. $63-25.$ 27. $64-35.$ 30. $78-31.$ 33. $92-78.$

1. Mr. Emerson bought a stock of groceries for $ 3897 and sold them for $ 5296. How much did he gain?

$ 5296
3897
$ 1399 *Ans.*

After we have taken 1 ten from 9 tens in the minuend, how many tens are left? We cannot take the 9 tens in the subtrahend from the 8 tens left in the minuend, so what must we do?

Test all your work. The subtrahend + the remainder = ?

2.	842	3.	435	4.	583	5.	694	6.	803	7.	715
	647		238		245		598		654		678
8.	5643	9.	4521	10.	3462	11.	3573				
	2738		2618		2548		1628				
12.	6411	13.	5343	14.	4701	15.	3603				
	2508		2517		2654		1672				
16.	5007	17.	3541	18.	4504	19.	4791				
	2548		2496		1576		2432				
20.	$ 421.35	21.	$ 846.30	22.	$ 6937.15	23.	$ 2341.17				
	143.29		298.41		486.29		1935.48				
24.	1200	25.	1000	26.	$ 439.21	27.	8435	28.	4605		
	1199		983		248.41		6598		2719		

29. How much money must be added to $ 436 to make $ 1321?

30. In the year 1895 Mr. Finch had $ 4378 in the bank. In 1903 he had $ 5247. *a.* How much did he save in that time? *b.* In how many years did he save it?

Can you get the first five right in two minutes? Write only the answers.

1.	2.	3.	4.	5.
403	$12.50	419	576	2)8642
516	1.35	−263	×9	
940	6.23			
768	1.79	6. 708	7. 375	8. 467
24	7.00	×7	×9	×6

9. Mr. West is 6 ft. tall. How many inches tall is he?

10. A window sill is 84 inches from the ground. How many feet above the ground is it?

11. A merchant bought goods amounting to $530 and paid $260 down. How much did he still owe?

12. If a steamboat goes 512 miles in a day, how far will it go in 6 days?

13.	14.	15.	16.
$42.10	$39.24	$18.19	$4.93
×6	×5	×4	×3

17. The subtrahend is $375.39, the minuend $483.29. Find the remainder.

18. 1476 is the difference between 4325 and what other number? (Two answers.)

19.	20.	21.	22.	23.
5462	2000	4605	$30.06	2741
−2735	−729	−2719	−12.74	−659

24. A train of 9 cars has 79 passengers in each car. How many passengers in all the cars?

25. An ocean steamer can carry 789 passengers at each trip. How many can she carry at 7 trips?

The *value* of any figure depends on its **place**; and *every time a figure is moved one place to the* **left** *its value is* **multiplied by ten**, thus:

$60 = 6 \text{ tens} = 6 \times 10 \qquad = 6 \times 10$

$600 = 6 \text{ hundreds} = 6 \times 10 \times 10 \qquad = 6 \times 100$

$6000 = 6 \text{ thousands} = 6 \times 10 \times 10 \times 10 = 6 \times 1000$

1. $5 \times 10 = ?$ $\quad 5 \times 100 = ?$ $\quad 5 \times 1000 = ?$

2. $9 \times 10 = ?$ $\quad 9 \times 100 = ?$ $\quad 9 \times 1000 = ?$

3. When we multiplied 6, 5, and 9 by 10, we annexed what to them? By 100? By 1000?

4. How can we multiply a number by 10? By 100? By 1000?

5. *Multiply by* 10:

7; 43; 55; 79; 3; 436; 581; 3245; 4823.

6. *Multiply by* 100:

8; 9; 7; 4; 3; 2; 14; 81; 37; 40; 324; 561.

7. *Multiply by* 1000:

1; 2; 5; 8; 12; 61; 19; 83; 10; 425; 306; 420.

8. If one horse is worth \$225, what are 30 such horses worth? How shall we find it?

\$225
30
\$6750

$30 = 3 \times 10$; therefore, multiplying by 30 is the same as multiplying by 3 and then by 10.

9. Multiply 248 by 30; 50; 60; 80; 70; 90; 40.

10. 29
700
20300

$29 \times 700 = 29 \times 7 \times 100.$

11. Multiply 34 by 700; 500; 200; 9000; 8000.

1. Mr. Johnson sells threshing machines at $537 apiece. How much does he receive for 39 machines? What must we do to find it?

537
39
4833 = 537 × 9
1611 = 537 × 30
20943 = 537 × 39

39 = 30 + 9; therefore, we may multiply 537 by 30 and by 9 and add the products.

4833 and 16110 are called partial products. The 0 may be omitted from units' place in the second partial product.

2. 127	3. 206	4. 346	5. 710	6. 532	7. 712
34	25	15	32	21	33
8. 543	9. 673	10. 274	11. 148	12. 714	13. 324
22	13	16	14	25	34
14. 212	15. 742	16. 632	17. 427	18. 654	19. 475
16	24	70	63	37	38
20. 749	21. 746	22. 807	23. 237	24. 415	25. 474
67	78	89	78	69	68

26. 7 sacks of flour at $1.35 cost how much?

27. 6 pounds of coffee for $1.32 is how much a pound?

28. At $1.75 a day, how much can a man earn in a week?

29. $7.35 paid on a debt of $10.00 leaves how much unpaid?

30. How many chapters from chapter XXVIII to chapter XCIV?

31. From 120 apples, take 7 dozen apples.

Quick Test

Teacher dictates questions. Pupils write answers. Pass papers, mark them, and make report.

1. How many months are there in 11 years?
2. $\frac{1}{4}$ of a day is how many hours?
3. On what number is the minute hand at 20 minutes past two?
4. How many seconds are there in $\frac{1}{6}$ of a minute?
5. At 20¢ a gallon, what will 1 qt. of milk cost?
6. Bought 10 qt. of cherries at 9¢ a quart and gave the clerk a silver dollar. What change should I receive?
7. Potatoes at 48¢ a bushel are how much a peck?
8. Hickory nuts at 5¢ a quart are how much a peck?
9. How many pints in 11 gallons?
10. How many days in 12 weeks?

Oral

1. From 100 subtract 30; 20; 50; 80; 10; 70; 40.
2. $65-28=?$ (Say 65, 45, 37.)
3. $84-28$ 5. $93-54$ 7. $59-29$ 9. $83-26$
4. $76-37$ 6. $46-38$ 8. $81-17$ 10. $48-29$
11. $49\times10=$ ——; $73\times100=$ ——; $8\times1000=$ ——.
12. How many dresses will 36 yd. of silk make if 9 yd. will make one dress?
13. 3 dozen eggs cost \$.39. One dozen costs ——.
14. How many minutes in 8 hours? In 7 hours?

Numbers of Days in the Different Months:

January 31	April 30	July 31	October 31
February 28	May 31	August 31	November 30
March 31	June 30	September 30	December 31

February has 29 days once in four years (Leap year).

1. *a.* How many days in a common year?

b. How many days in a leap year?

c. How many June days have you seen? July days?

d. How many December days have you seen? April days?

e. How many days in 57 common years?

f. How many days in 89 leap years? 44 leap years?

g. How many hours are there in a common year?

h. How many hours are there in a leap year?

i. How many hours are there in 9 leap years?

2. How many seconds are there in an hour?

3. How many minutes are there in a day?

4. How many seconds are there in a day?

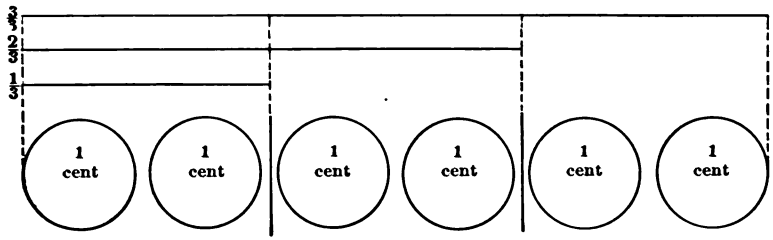
5. How many school weeks in 475 school days?

6. If there are 8 grades between the kindergarten and the high school, and it takes 200 days to pass each grade, how many days must you attend school to go through all the grades?

7. Find the cost of 5 books at $1.87 each.

8. $203 paid for 7 cows is how much apiece?

9. $152 will buy how many washing machines at $8 each?



NOTE. — This lesson is not intended to teach fractions. It is merely an application of multiplication and division.

1. Here are how many cents? $\frac{1}{3}$ of 6 cents = —— cents. $\frac{2}{3}$ of 6 cents = 2 × —— cents = —— cents.

2. Make 12 cents. Find $\frac{1}{3}$ of 12¢; $\frac{2}{3}$ of 12¢.

3. Draw a line 20 in. long. Find $\frac{1}{4}$ of 20 in.; $\frac{2}{4}$ of 20 in.; $\frac{3}{4}$ of 20 in.; $\frac{1}{5}$ of 20 in.; $\frac{2}{5}$ of 20 in.; $\frac{4}{5}$ of 20 in.

4. Draw a line 1 yd. long. Mark the inches. $\frac{1}{4}$ yd. is —— inches; $\frac{2}{4}$ yd. = —— in.; $\frac{3}{4}$ yd. = —— in.

5. $\frac{1}{3}$ of a yard is —— inches; $\frac{2}{3}$ yd. = —— in.

6. $\frac{1}{6}$ of a yard is —— inches; $\frac{5}{6}$ yd. = —— in.

7. Picture 10 marbles. Mark off $\frac{1}{5}$ of 10 marbles; $\frac{4}{5}$.

8. $\frac{2}{5}$ of 10 marbles are —— marbles; $\frac{3}{5}$ of 10 marbles are —— marbles; $\frac{4}{5}$ of 10 marbles are —— marbles.

9. How many eggs in $\frac{2}{3}$ of a dozen? $\frac{3}{4}$ of a dozen?

10. A pie is worth 20 cents. What is $\frac{1}{4}$ of it worth? $\frac{2}{4}$? $\frac{3}{4}$? $\frac{1}{5}$? $\frac{3}{5}$? $\frac{4}{5}$? Make two pictures of the pie. Cut one into fourths, the other into fifths.

11. How many hours in $\frac{3}{4}$ of a day? $\frac{2}{3}$? $\frac{5}{6}$? $\frac{3}{8}$? $\frac{5}{8}$? $\frac{7}{8}$?

12. If you are awake $\frac{2}{3}$ of the time, you are awake how many hours each day? How many hours do you sleep?

1. Find $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{3}{5}$, $\frac{5}{6}$, $\frac{5}{7}$, $\frac{6}{7}$, $\frac{7}{8}$, $\frac{5}{8}$, $\frac{2}{9}$, $\frac{8}{9}$ of 2520.

2. *a.* If an acre of land costs \$175, what would 84 acres cost? *b.* $\frac{3}{5}$ of an acre?

3. Mr. Rich earns \$25.76 per week. His son earns $\frac{6}{7}$ as much. *a.* How much does the son earn? *b.* How much more does the father earn than the son? *c.* How much do both earn?

4. Multiply twenty-nine thousand four hundred sixty-three by fifty-seven. Write the product in words.

5. A man had 196 books. He gave his son $\frac{5}{7}$ of them. *a.* How many books did the son receive? *b.* How many did the man keep?

6. The Revolutionary War began in 1775, and the Spanish War in 1898. How many years between the two wars?

7. *a.* Find the product of 842 and 76. *b.* $27684 \div 9 = ?$

8. Bought a carriage for \$125 and sold it for \$98. How much did I lose?

9. *a.* $448 \div 7 = ?$ *b.* $390 \div 5 = ?$ *c.* $863 \times 9 = ?$

10. A man having 320 sheep sold 284. How many had he left?

11. A boy had saved \$2 and then spent \$.60 for presents. How much had he left?

12. Leo had \$3.68 and his father gave him enough to make \$5.00. How much did his father give him?

13. A man owed \$265 and paid \$199. How much did he still owe?

1. $5+8+7+6+9=?$
2. Write 19 in Roman.
3. Find the cost of 8 pounds of sugar at 5 cents a pound.
4. Add 62 and 31.
5. Subtract 49 from 83.
6. Find $\frac{6}{7}$ of 28.
7. How many quarts in 3 pk. of onions?
8. 120 minutes are how many hours?
9. How many inches in 9 feet?
10. $7 \times 9+8-7=?$

Oral Problems

1. If 7 oranges cost 21 cents, 1 orange costs —— cents. 5 oranges cost —— cents. Make the question.

2. *a.* When Bessie picked 5 qt. of berries on Monday, 8 on Tuesday, and 7 on Wednesday, in the three days she picked —— quarts.

b. If she sold 10 quarts and gave the rest to her mother, she gave her mother —— quarts.

3. If a dozen oranges cost 48 cents, 1 orange costs —— cents. 11 oranges cost —— cents. Question.

4. In 10 quarts there are —— pints. If 1 pt. of milk costs 3 cents, 20 pints will cost —— cents. Question.

5. If eggs are $.24 a dozen, 1 egg costs —— cents. 7 eggs cost —— cents. Question.

6. If 10 eggs cost 30 cents, 1 egg costs —— cents. A dozen eggs cost —— cents. Question.

Answer to yourself these questions about each problem: *a. What is asked? b. What is told? c. What must I find first?*

1. A lady bought 3 dozen buttons at 8 cents a dozen, and a yard of ribbon at 10 cents. What did she pay for both?

2. John walked 4 miles and Roy walked five times as far. How far did Roy walk? How far did both walk?

3. A man earned $8 one week, $9 the next, $10 the next. How much money did he earn in the three weeks? He put $20 in the bank and spent the rest. How much did he spend?

4. At 6¢ a quart, what will 3 gal. of oil cost?

5. How many 5-cent car fares can be paid with a quarter, a dime, and a half dime?

6. Elsie bought a tablet for 8 cents, a stamp for 2 cents, and some pencils for 9 cents. She gave the clerk a quarter. How much change should she receive?

7. A man earned $42 and used $\frac{6}{7}$ of it. How much did he use? How much had he left?

8. Four oranges cost 12 cents. At the same price, what must be paid for 8 oranges?

9. A man earns $15 a week and saves $\frac{1}{5}$ of it. How much does he save in one week? How long will it take him to save $27? How much will he save in 12 weeks? How much does he spend in a week? In 4 weeks?

10. Ned has three rabbits and Ted four times as many. How many has Ted? How many have both?

1. A milkman had 2 cans of milk with 6 gallons in each can. How many quarts of milk had he?

2. If 5 pencils cost 15 cents, what will 1 pencil cost? What will 3 pencils cost? 10 pencils? 11 pencils?

3. $\frac{3}{4}$ of a yard of ribbon is how many inches long?

4. A four-foot rule could be cut into how many sticks, each six inches long?

5. 3 min. = —— sec. 2 hr. = —— min.

6. 4 wk. = —— da. 5 yr. = —— mo.

7. $\frac{1}{2}$ hr. = —— min. 7 gal. and 3 qt. = —— qt.
9 qt. and 1 pt. = —— pt.

8. 4 doz. + 3 = ——. 8 doz. + 2 = ——.
6 doz. + 11 = ——. 11 doz. + 6 = ——.

9. How many dozen, and how many over, in 17? 27? 39? 46? 54?

10. Multiplication table, page 73.

11. *Read each number in the inner square before every sign in the outer squares, and find the result.*

+5	÷2	−7	÷12
÷3	36 72 108		×10
÷6			−29
÷9	÷4	−11	+9

12. $4 \times 8 + ? = 35$. $7 \times 9 + ? = 69$.

13. $7 \times 7 + ? = 58$. $8 \times 6 + ? = 54$.

14. What is the time when the hour hand is at VIII? Where is the minute hand then?

15. What is the time when the hour hand is between V and VI and the minute hand is at III? When the minute hand gets to IX?

16. What is the cost of 2 bu. of potatoes at 10¢ a peck?

1. Find 7 times 389 by addition and by multiplication.

2. Find by subtraction how many 16's in 176; in 96; in 144; in 80; in 160; in 112; in 128.

3. *Copy answers only. Add up and down. How long will it take?*

a.	*b.*	*c.*	*d.*	*e.*
463	453	$478.45	$165.35	$ 4.10
274	224	85.46	48.64	467.20
632	35	300.18	8.03	254.18
49	368	63.24	6.00	325.16
548	74	.65	17.40	49.21
231	989	49.85	5.84	8.00
598	6785	237.46	97.68	77.56

4. *a.* 3642×24; *b.* 4832×34; *c.* 2356×43; *d.* 805×96.

5. At our festival we used 125 gallons of ice cream. *a.* How many quarts were used? *b.* If each quart was served to 6 persons, how many persons ate of the cream?

6. *a.* A market man bought 1057 pounds of beef, 538 pounds of mutton, and 457 pounds of veal. How many pounds of meat did he purchase? *b.* After he had sold 986 pounds of meat, how many pounds remained?

7. Find the quotient and remainder: *a.* $347 \div 5$; *b.* $643 \div 6$; *c.* $487 \div 8$; *d.* $3067 \div 9$; *e.* $4234 \div 7$; *f.* $613 \div 9$; *g.* $4134 \div 8$.

8. 48 bushels of potatoes at $.55 a bushel cost how much?

9. A grocer has 432 bu. of potatoes. How many customers can he supply with a peck apiece?

Papers sold by seven boys during one week:

	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.
Henry . . .	36	28	24	14	26	32
Carl	24	35	25	16	18	26
Jerry	18	23	26	24	28	29
Frank . . .	29	18	21	32	27	35
Charles . . .	15	26	18	27	34	36
Roy	34	31	30	28	26	27
Edward . . .	12	23	20	19	27	28

1. Find the number of papers sold on Monday; Tuesday; Wednesday; Thursday; Friday; Saturday.

2. Find the number sold by Henry; Carl; Jerry; Frank; Charles; Roy; Edward.

3. Find: *a.* The number sold on all the days. *b.* The number sold by all the boys. *c.* How do these two numbers compare?

4. *a.* $\begin{array}{r} 714 \\ \times 8 \\ \hline \end{array}$ *b.* $\begin{array}{r} 1264 \\ \times 7 \\ \hline \end{array}$ *c.* $\begin{array}{r} 207 \\ \times 9 \\ \hline \end{array}$ *d.* $\begin{array}{r} 740 \\ \times 6 \\ \hline \end{array}$ *e.* $\begin{array}{r} 1273 \\ \times 4 \\ \hline \end{array}$ *f.* $\begin{array}{r} 6701 \\ \times 5 \\ \hline \end{array}$

5. *a.* $9\overline{)317}$ *b.* $8\overline{)2657}$ *c.* $9\overline{)2890}$ *d.* $9\overline{)3069}$

6. At 3¢ each, how many lemons will 72¢ buy?

7. \$6.28 out of a \$10 bill leaves how much change?

8. There are 27 daisies in one vase and 3 times as many in another. How many in both vases?

9. Find the cost of 7 tons of coal at \$4.75 a ton.

10. John earned \$18 during the vacation and spent \$12.75. How much did he save?

1. *Moving a figure to the* **left** *one place multiplies its value by* 10. Moving a figure one place to the right does what to its value?

2. $9 \times 10 = 90$. $90 \div 10 = ?$ $23 \times 10 = 230$. $230 \div 10 = ?$

3. *To multiply a number by* 10 *we annex a* 0.
How can we divide a number by 10?

4. *Divide by* 10:
80; 60; 130; 740; 800; 4360; 560; 1300; 2080.

5. *To multiply a number by* 100 *we annex two ciphers.*
How can we divide a number by 100 if it has ciphers at the end?

6. *Divide by* 100:
600; 900; 1200; 2300; 6000; 48000; 64500; 360000.

Written

7. $8\emptyset\overline{)256\emptyset}$ (32). $80 = 8 \times 10$. To divide by 80 we divide by 10 and then by 8. How do we divide by 10?

8. *a.* $30\overline{)34920}$ *b.* $40\overline{)2480}$ *c.* $50\overline{)4750}$ *d.* $60\overline{)720}$

9. *Divide by* 90:
a. 1620; *b.* 4770; *c.* 71100; *d.* 108000; *e.* 17280.

10. $500 = 5 \times 100$. How may we divide 4500 by 500?

11. *a.* $500\overline{)1500}$ *b.* $500\overline{)7500}$ *c.* $700\overline{)11200}$ *d.* $600\overline{)72000}$

12.	13.	14.
a. 342×60	*a.* $490 \div 70$	*a.* $4800 \div 80$
b. 34×90	*b.* $34600 \div 40$	*b.* $62500 \div 500$
c. 81×700	*c.* $27900 \div 90$	*c.* $91000 \div 700$
d. 495×310	*d.* $6420 \div 60$	*d.* $34000 \div 2000$

1. *Add up, then down. Write only the sums.* 5 *minutes?*

a.	*b.*	*c.*	*d.*	*e.*
$548.42	4835	4782	63854	$381.15
57.54	724	95	9763	42.81
6.00	89	398	427	68.73
.84	38984	27579	5106	59.42
346.99	35	49895	78243	486.53
24.63	672	6879	4675	79.49
51.06	4897	4623	1016	83.26

2. *Find the differences and test results:*

a.	*b.*	*c.*	*d.*	*e.*
7821	$200.14	$800.00	7421	8402
6459	89.27	256.13	1695	1673

3. *Multiply: a.* 763 by 42. *b.* 529 by 44. *c.* 862 by 31. *d.* 720 by 43.

4. Find: *a.* $\frac{1}{7}$ of 2982. *b.* $\frac{1}{8}$ of 2832. *c.* $\frac{1}{9}$ of 5715. *d.* $\frac{1}{4}$ of 2732.

5. *a.* If our living expenses are $7.56 a week, how much are they for 1 day? *b.* For 9 days? *c.* For 5 days? *d.* For 4 weeks?

6. Find: *a.* $\frac{1}{7}$ of 651. *b.* $\frac{5}{7}$ of 651. *c.* $\frac{1}{8}$ of 5640. *d.* $\frac{7}{8}$ of 5640.

7. *a.* 43×500. *b.* 691×70. *c.* 39×3000. *d.* 865×80. *e.* 196×39.

8. How many days in the first six months of the year?

9. Counting 30 days for a month, how many months in 180 days?

10. How many quarts in 798 bushels?

1. If a grain car will carry 756 bu. of corn, how many bushels will 243 such cars carry? What operation must be performed?

$$
\begin{array}{r}
756 \\
243 = 200 + 40 + 3 \\
\hline
2268 = 756 \times 3 \\
3024 = 756 \times 40 \\
1512 = 756 \times 200 \\
\hline
183708 = 756 \times 243
\end{array}
$$

What is the answer? What have we omitted from the second and third partial products?

2. Henry's kite string is 648 ft. long. How many feet of twine would it take to make 207 such kite strings? How many partial products will you have? Where will you write the first figure of the second partial product?

3. A tract of land is laid out in 248 lots, each one for sale at $375. If the owner sells all of them at that price, how much will he receive for them?

4. Multiply 239 by 158. Multiply 158 by 239. How do the products compare?

5. Find how 412 times 653 compares with 653 times 412.

Find the products in two ways:

6. 385×209	10. 209×506	14. 854×305
7. 842×351	11. 983×786	15. 907×635
8. 496×258	12. 428×732	16. 294×687
9. 324×807	13. 356×271	17. 839×594

18. If a baggage car goes 248 miles every day, how many miles will it go in a year?

NOTE. — Have scales before the class.

1. For what are the scales used?

2. Find the pound weight.

3. Let each pupil take the pound weight in his hand.

4. Name articles that weigh about a pound. Weigh them.

5. Put sand in a bag until you think you have a pound. Weigh and correct it.

6. Use the bag of sand for a pound weight. Find the ounce weight. Weigh out several ounces of sand in bags. Find how many ounce bags are needed to balance the pound bag.

7. There are —— ounces (oz.) in 1 pound (lb.).

8. Name articles that are sold by the pound; by the ounce.

9. How many ounces are there in 2 lb.? 3 lb.? 5 lb.?

10. How many ounces in $\frac{1}{2}$ lb.; $\frac{1}{4}$ lb.; $\frac{1}{8}$ lb.?

11. How many ounces in $1\frac{1}{2}$ lb.; $2\frac{1}{2}$ lb.; $1\frac{1}{4}$ lb.?

12. Mr. Jolly, the candy maker, gave away 25 lb. of candy, putting 1 oz. into each bag. How many bags of candy did he give away?

13. *a*. How many days will 7 lb. of sugar last you if you eat an ounce every day? *b*. How many weeks?

14. If the average weight of the plums on a certain tree is 1 oz., how many plums will it take to weigh 395 lb.? 476 lb.? $\frac{1}{2}$ lb.? $\frac{3}{4}$ lb.? $\frac{5}{8}$ lb.?

1. How much is $\frac{1}{4}$ of a peck? $\frac{1}{10}$ of \$ 150?

2. If I give a dollar in payment for 9 qt. of peaches at 10¢ a quart, what change should I receive?

3. *Find the sums and differences:*

68	54	78	49	51	63	58	41	53
29	26	16	27	33	37	29	24	39

4. How many feet in 108 inches? How many yards?

5. How many times can a two-quart measure be filled from a bushel of walnuts?

6. I have 12 rows of strawberry plants with 12 plants in each row. How many plants have I?

7. Find the cost of 8 tons of rye straw at \$ 20 a ton.

Written

1. At Mann's store 85 crates of Georgia peaches, each crate containing 6 baskets, were sold in 1 day.

a. How many baskets were sold? *b.* If there were 34 peaches in each basket, how many peaches were sold?

2. *a.* If a boy can ride his bicycle 6 miles an hour, how many hours will it take him to ride 288 miles?

b. If he rides 6 hours a day, how many days will it take?

3. From the sum of 4623 and 5498 subtract their difference.

4. If 3 horses cost \$ 678, what will 12 horses cost at the same rate? (12 is how many times 3?)

5. 43×280 6. 231×600 7. 435×309 8. $9\overline{)649}$ 9. $6\overline{)435}$

PART III

1. A dealer bought 13 carriages for $3055. What did each cost?

$$13\overline{)3055}\quad 235$$

26

45

39

65

65

PROCESS

$\frac{1}{13}$ of 30 hundreds is 2 hundreds and 4 hundreds over. 4 hundreds and 5 tens are 45 tens. $\frac{1}{13}$ of 45 tens is 3 tens and 6 tens over. 6 tens and 5 units are 65 units. $\frac{1}{13}$ of 65 units is 5 units.

Find the quotients and test your work by multiplication:

2.	$13\overline{)2015}$	9.	$31\overline{)7223}$	16.	$43\overline{)1591}$	23.	$61\overline{)5612}$
3.	$13\overline{)2327}$	10.	$32\overline{)5632}$	17.	$51\overline{)6987}$	24.	$61\overline{)5307}$
4.	$21\overline{)5103}$	11.	$13\overline{)1742}$	18.	$51\overline{)7446}$	25.	$42\overline{)9282}$
5.	$13\overline{)2769}$	12.	$41\overline{)7667}$	19.	$52\overline{)6864}$	26.	$21\overline{)9261}$
6.	$21\overline{)13335}$	13.	$41\overline{)4018}$	20.	$52\overline{)3952}$	27.	$15\overline{)3195}$
7.	$22\overline{)7524}$	14.	$31\overline{)7254}$	21.	$14\overline{)3234}$	28.	$16\overline{)688}$
8.	$41\overline{)3239}$	15.	$42\overline{)6468}$	22.	$23\overline{)9568}$	29.	$16\overline{)1984}$

30. One factor of 247 is 13. What is the other factor?

31. The product of two numbers is 6804. One of the numbers is 14. What is the other number?

32. In one mile there are 5280 ft. $\frac{1}{15}$ of a mile = ? ft.

33. Find $\frac{7}{13}$ of 364; $\frac{9}{13}$ of 5005; $\frac{11}{13}$ of 1638; $\frac{4}{7}$ of 3556.

34. $\frac{5}{14}$ of 1190 = ? $\frac{8}{14}$ of 3332 = ? $\frac{13}{14}$ of 6314 = ?

35. Find $\frac{3}{5}$ of 2730; find $\frac{2}{3}$, $\frac{5}{7}$, $\frac{6}{13}$, $\frac{9}{14}$, $\frac{7}{15}$, $\frac{4}{15}$ of 2730.

36. How many pounds in 48 oz.? 832 oz.? 144 oz.?

1. How many quart boxes can be filled from 25 bu. of peaches?

2. $\frac{1}{2}$ bu. = —— qt. How many half-bushel baskets could be filled from 288 qt. of chestnuts?

3. A four-gallon can holds —— qt. How many four-gallon cans could be filled from 272 qt. of oil?

4. If William earns $ 16 a month, how many months must he work to earn $ 576?

5. See how quickly you can get correct answers:

a. 3421×45; *b.* 4326×51; *c.* 5678×55; *d.* 9834×43.

6. Find quotients and remainders and test your work:

a. $5\overline{)393}$; *b.* $6\overline{)497}$; *c.* $7\overline{)899}$; *d.* $8\overline{)943}$; *e.* $9\overline{)4875}$.

7. How many pounds in 2112 oz.?

8. 42 lb. and 12 oz. are how many ounces?

9. At $ .06 a quart what will 65 gal. of milk cost?

10. One factor of 675 is 15. What is the other?

11. In 3600 seconds how many minutes?

12. Find quotients and remainders and test your work:

a. $439 \div 13$; *b.* $513 \div 14$; *c.* $1835 \div 8$; *d.* $459 \div 7$.

13. Find: *a.* $\frac{2}{3}$ of 675; *b.* $\frac{3}{4}$ of 732; *c.* $\frac{2}{5}$ of 580.

14. Multiply: *a.* 472 by 69; *b.* 803 by 105.

15. Divide: *a.* 8320 by 20; *b.* 7960 by 40.

16. Find the number of hours in the month of October.

17. Find the number of minutes in the month of October.

18. If a man works 9 hours a day, in how many days will he work 3681 hr.?

1. How many ounces in a half pound?

2. How many ounces in $\frac{3}{4}$ of a pound?

3. How many 12's in 52 and how many over?

4. 12 gal. and 3 qt. are how many quarts?

5. At 5¢ a foot, what will a yard of picture moulding cost?

6. A half hour is how many minutes?

7. If you buy a book for $.15, how much change should you get from a quarter?

8. Four dimes and a half dime are how many cents?

9. How many inches in a yard?

10. Two quarts of berries at 10¢ a quart and a loaf of bread at 5¢ cost how much?

Oral

1. How many pints in 4 gal.?

2. A quart is what part of a gallon? 2 qt.? 3 qt.?

3. $\frac{5}{6}$ of a yard is how many inches?

4. Charles was punctual at school every morning for 20 weeks. How many times was he punctual?

5. $\frac{1}{8}$ of 40 = ? $\frac{1}{5}$ of 40 = ? What part of 40 is 5?

6. How many 6's in 12? 6 is what part of 12? 6 months is what part of a year?

7. Sarah's brother earns $16 a week and saves $\frac{1}{4}$ of it. In how many weeks can he save $20?

8. Candy at 2¢ an ounce is how much a pound? What is a quarter of a pound worth? A half pound?

1. In 48 pecks there are how many quarts?

2. The Pilgrims came to America in 1620. How long ago was that?

3. Bought a lot for $598. For what must I sell it to gain $59?

4. A milkman sells 36 gallons of milk every day. *a.* How many pounds does it weigh if a pint weighs a pound? *b.* How many ounces does it weigh?

5. Robert bought some clothes for $5.45. He gave the clerk a $5 bill and a silver dollar. How much change should he receive?

6. 5 tons of coal cost $27.50. Find the cost of 1 ton.

7.	8.	9.	10.	11.
423	524	4031	4706	5072
−297	−349	−1234	−927	−3095

12. *Write in words:* 31,605; 270,040; 341,005; 104,500.

13. *Write in figures:* three hundred thousand twenty; eighteen thousand fourteen; six thousand three hundred thirty; one hundred fifty-seven thousand nine.

14. *a.* $\frac{2}{3}$ of 1032; *b.* $\frac{3}{4}$ of 992; *c.* $\frac{4}{5}$ of 560; *d.* $\frac{3}{5}$ of 1675.

15. From seventy dollars and twenty-nine cents take fifty-two dollars and sixty-nine cents.

16. At 30 cents a peck, what will 3 bu. of apples cost?

17. A lady had $135. She paid $45 for a sewing machine and $22 for cloth. How much has she left?

18. There are 7 dozen lemons in one box and 83 lemons in another. How many lemons in both boxes?

1. Divide 1134 by 21. To find the first figure in the quotient, ask yourself, "How many 2's in 11?"

2. *Divide by* 21:

a. 8883; *b.* 6515; *c.* 19677; *d.* 9639.

3. Divide 2573 by 31. To get the first quotient figure say, "How many 3's in 25?"

4. *Divide by* 31:

a. 2635; *b.* 2883; *c.* 3875; *d.* 14353.

In examples 5–19, *find the quotients and test your work by multiplication:*

5. $1599 \div 41$	10. $814 \div 22$	15. $2108 \div 62$
6. $6068 \div 41$	11. $2912 \div 32$	16. $6912 \div 72$
7. $2346 \div 51$	12. $768 \div 32$	17. $4756 \div 82$
8. $2275 \div 91$	13. $3486 \div 42$	18. $1288 \div 92$
9. $1386 \div 22$	14. $4992 \div 52$	19. $2511 \div 93$

Find the products and test your work by division:

20. 46×31	22. 124×32	24. 93×52
21. 53×21	23. 63×61	25. 242×71

26. One factor of 3844 is 62. Find the other factor.

27. $43 \times ? = 5203$. 28. $11070 \div ? = 82$. 29. $? \times 61 = 1159$.

30. The multiplier is 42. The product is 3444. What can you find?

31. The divisor is 78, the quotient 467. What can you find?

32. Lucien sold 806 papers in the month of May. That was how many per day?

Every problem tells us something and asks us to find something. We use what is told, to find what is asked. The following exercises tell you something. *Ask the question in each one and answer it.*

1. Berries are 10 cents a quart. John bought 7 qt.

2. Mary had 21 cents. Oranges cost 3 cents apiece.

3. Seven pounds of maple sugar cost 84 cents.

4. Chester is 5 ft. tall. There are —— inches in a foot.

5. There are —— seconds in a minute. It takes Leah 5 seconds to answer a question.

6. Chocolate creams cost 3¢ an ounce. There are —— ounces in a pound.

7. Frances earned 11 cents on Friday, 9 cents on Tuesday, and 10 cents on Wednesday.

8. Richard earned 41 cents and paid 5¢ for car fare.

9. Nina took a music lesson twice a month for a whole year. There are —— months in a year.

10. Robert is 14 years old. His sister Dorothy is ten.

11. Mary is 19 years old. Frederick is 7 years younger.

12. Lemons are 24 cents a dozen. Ethel bought 6 lemons.

13. There are 8 hours in a working day. Philip worked 72 hours.

14. Make a problem for $\$.05 + \$.06 + \$.07$.

15. $\frac{1}{4}$ of $16 = ?$ Make a problem.

16. $\frac{3}{4}$ of $36 = ?$ Make a problem.

17. $10 \times 2 = ?$ Make a problem.

1. John paid $.36 for 9 packages of flower seed. Question.

2. Wilbert has a strip of oak 5 ft. long. He is making 6-inch rules. Question.

3. Make a problem for 4 times 12 in.

4. A bushel of potatoes is worth 60 cents. A peck is —— of a bushel. Question.

5. Alice made a dozen pop-corn balls. Lena made three times as many. How many did both make?

6.

3	6	2	12	11	4	10	8	5	9	7

× 7, 8, 9.

7. At $.06 a pound, find the cost of 3 lb. of starch; 8 lb.; 10 lb.; 9 lb.; 12 lb.; 50 lb.; 11 lb.; 20 lb.; 7 lb.

8. 33 bananas were sold from a bunch containing 7 dozen. How many were left?

Written

1. January, March, May, July, August, October, and December have each 31 days. How many days in all these months? Find it in two ways.

2. A man in Vermont made 388 qt. of maple sirup. He put it into gallon cans. Question. Answer?

3. Make a problem for $84.50 – $13.27.

4. Make a problem for 38 × 7 da.

5. Write in words: 304,091; 20,040; 100,001; $50.03.

6. I saw an ocean steamship 499 feet long. There are —— inches in a foot. Question. Answer?

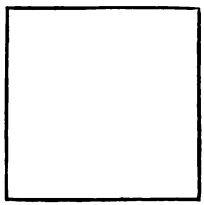


FIG. 1.

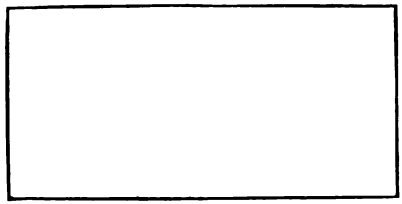


FIG. 2.

1. What is the shape of Figure 1? How long is it? How wide?

What is it called? Describe a **square inch** (*sq. in.*).

2. Without a rule, draw a square inch. Measure and correct it.

3. The corners of a square are *right angles*. This is a right angle ⌊. How many right angles has a square?

4. What kind of angles has Figure 2?

5. How many right angles has Figure 1? Figure 2?

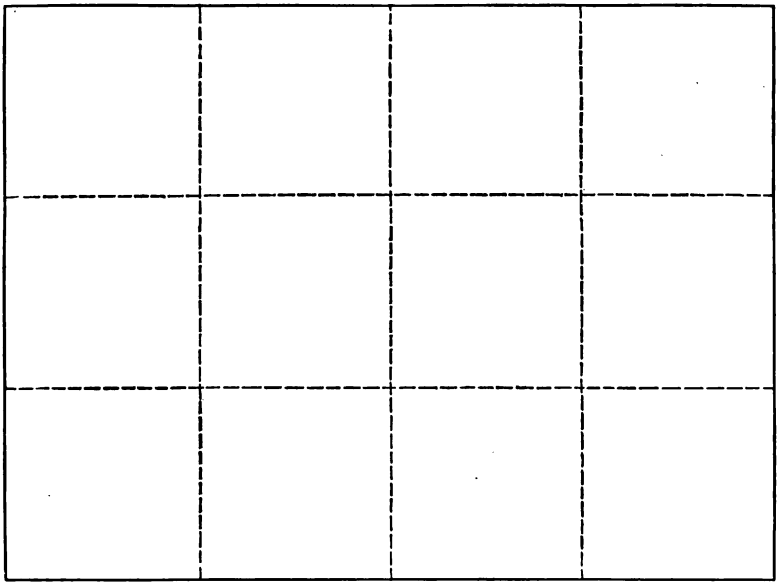
6. Figure 1 and Figure 2 are **rectangles.** Describe a rectangle.

7. A rectangle may be either square or oblong. Make an oblong rectangle 3 in. long and 1 in. wide. Draw lines cutting it into square inches. How many square inches are there?

8. Find out how many square inches in an oblong 1 inch wide and 3 inches long; 4, 5, 6, 10, 11, 13 inches long.

9. Draw a rectangle three inches long and 2 inches wide. Mark it off into square inches and count them.

10. Draw a square 3 in. long. Mark it off into square inches and count them.



1. What is the name of this figure? How wide is it? How long? Its size is **3 in. by 4 in.**

2. The dotted lines drawn from left to right divide the rectangle into oblongs how long and how wide? How many of them?

3. Each oblong 4 in. long and 1 in. wide contains how many square inches? How many square inches in all of them? Three times 4 sq. in. are how many square inches?

4. The dotted lines from top to bottom divide the rectangle into how many oblongs? Each of these oblongs is how long? How wide? It contains how many square inches? All of them contain how many square inches?

1. Draw a rectangle which you think is 6 in. by 5 in. Measure and correct it. Mark out a row of square inches along one side of it. How many square inches in this row? How many such rows could you make from the whole rectangle? How many square inches in the rectangle? 5 times 6 sq. in. = ?

2. Make a rectangle 7 in. by 4 in. Mark it off into square inches. How many square inches in the rectangle? How do you find it?

3. Make a rectangle 8 in. by 6 in. How many square inches does it contain? How do you find it?

4. On the blackboard, draw a rectangle 18 in. by 7 in. How many square inches does it contain?

5. How many square inches in an oblong 24 in. by 12 in.? Make the drawing.

6. Find the number of square inches in the top of a table which is 22 in. by 38 in.

Find the number of square inches in each of the following rectangles:

7. 39 in. by 42 in.
8. 68 in. by 29 in.
9. 47 in. by 33 in.
10. 59 in. by 28 in.
11. 39 in. by 2 feet.
12. 62 in. by 37 in.
13. 41 in. by 48 in.
14. 36 in. by 19 in.
15. 38 in. by 40 in.
16. 3 ft. by 20 in.

17. *a.* A blackboard 2 ft. 6 in. wide is how many inches wide? *b.* A blackboard 4 ft. long is how many inches long? *c.* How many square inches in a blackboard 4 ft. by 2 ft. 6 in.?

1. Mr. Wilson bought a farm for $9044. How much must he save each year to pay for it in 19 years?

$$
\begin{array}{r}
476 \\
19)\overline{\$9044} \\
(20)\quad 76 \\
\hline
144 \\
133 \\
\hline
114 \\
114
\end{array}
$$

19 is almost 20. Think how many 2's in 9. To get the next quotient figure, think how many 2's in 14. To get the next quotient figure, think how many 2's in 11. 5 is a little too small, because it gives a remainder 19, the same as the divisor. What is the correct figure?

2. Divide 12499 by 29. (29 is almost 30. Let 3 be your *guide figure* and think how many 3's in 12, etc.)

3. Divide 2808 by 39. (39 is almost 40. What will you take for a guide figure?)

4.	$2808 \div 39$	11.	$4539 \div 89$	18.	$14732 \div 58$
5.	$24708 \div 29$	12.	$2772 \div 99$	19.	$4420 \div 68$
6.	$11837 \div 19$	13.	$792 \div 18$	20.	$6318 \div 78$
7.	$4508 \div 49$	14.	$10584 \div 28$	21.	$45056 \div 88$
8.	$36639 \div 59$	15.	$10353 \div 29$	22.	$6174 \div 98$
9.	$16008 \div 69$	16.	$2242 \div 38$	23.	$3315 \div 39$
10.	$64148 \div 79$	17.	$8064 \div 48$		

24. A train of 9 sleeping cars is 522 ft. long. How long is each car?

25. How many coal cars 31 ft. long would make a train 1395 ft. long?

26. When you have a product and one of its factors, how do you find the other factor? What is the length of a rectangle 12 in. wide that contains 840 sq. in.?

In paying the amounts given below, how much change should you receive from $1?

To find the change for 64 cents, —

Think { 64 + 6 = 70. / 70 + 30 = 100. / 30 + 6 = 36 *Ans.* } *Say* 6, 36.

$.12	$.14	$.16	$.18	$.13	$.15	$.17	$.19	$.11
.25	.27	.29	.25	.21	.22	.24	.26	.28
.31	.33	.35	.37	.39	.32	.34	.36	.38
.48	.46	.44	.42	.41	.43	.45	.47	.49
.56	.58	.52	.54	.59	.57	.55	.53	.51
.61	.69	.67	.65	.63	.64	.64	.66	.62
.76	.78	.77	.72	.73	.71	.75	.74	.79
.81	.88	.83	.87	.84	.85	.86	.82	.89
.95	.96	.99	.97	.94	.93	.98	.91	.92

Add the columns. Add the lines. Add the sums of the columns. Add the sums of the lines. Compare.

ROMAN NUMERALS

1. C = 100. CC = 100 + 100 = 200. CCC = 100 + 100 + 100 = ?
2. D = 500. CD = 500 − 100 = 400. DC = 500 + 100 = ?
3. M = 1000. CM = 1000 − 100 = ? DCCC = ?
4. C = ? XXVI = ? CXXVI = ? DC = ? LXV = ?
5. Read: DC; MC; MCC; CM; CCXX; CCCX; CXXX.
6. Read: DCCCXX; CDXXX; CCLXI; CXLVIII.
7. Write in Roman: 1000; 500; 300; 400; 600; 900.
8. Write in Roman: 140; 260; 320; 550; 450; 195.

1. *See how quickly you can get correct sums:*

a.	*b.*	*c.*	*d.*
$173.25	$836.42	$7000.42	497
92.47	1521.50	83.92	6839
9.38	936.08	6214.83	709
407.25	42.53	807.15	598
92.16	1006.27	78.26	763
57.84	83.44	9287.42	6908
9.26	64.29	383.52	89718

2. *Find the missing numbers. Test your work:*

a.	*b.*	*c.*	*d.*
645071	48356	58605	?
−280693	+ ?	− ?	× 59
?	97403	29567	708

3. Solve in figures DCLIX × CCXII.

4. $273018 \div 3$	10. $362416 \div 4$	16. 342×290
5. $452124 \div 3$	11. $122028 \div 4$	17. 4506×206
6. $151824 \div 3$	12. $253540 \div 5$	18. 1928×453
7. 4243×260	13. 312×600	19. $364218 \div 6$
8. 4506×206	14. 3424×60	20. $4530 \div 5$
9. 192×453	15. $3642 \div 6$	21. 3206×700

22. Find the number of square inches in a rectangle 98 in. by 70 in.

23. A rectangle contains 1710 sq. in. It is 30 in. wide. How long is it?

24. The product is 6447, one factor is 21. Find the other. Make a problem.

25. 392×508	26. $36048 \div 8$	27. 875×900

1. In 17 pt. there are —— qt. and —— pt.
2. In 23 qt. there are —— gal. and —— pt.
3. In 34 qt. there are —— pk. and —— pt.
4. 3 ft. and 2 in. are —— in. $3 \times 12 + 2 =$ ——.
5. In 39 pk. there are —— bu. and —— pk.
6. Wilfred picked 3 pk. 6 qt. of cherries. How many quarts did he pick?
7. I bought a piece of rope 36 ft. long and used $\frac{2}{3}$ of it for a swing. How many feet of rope did I use?
8. Harold picked a peck basket full of apples 29 times. How many bushels did he pick and how many pecks over?
9. If your tablet is 8 in. by 10 in., how many inch squares can you make on one page?

Written

1. One box holds 2 dozen lemons, and another 37 lemons. How many lemons in both boxes?
2. At \$ .05 an ounce, what will 2 lb. of candy cost?
3. Find the cost of 24 gal. of ink at 12¢ a pint.
4. 12 gal. 3 qt. of maple sirup at 25¢ a quart would cost how much?
5. A man bought coal for \$ 4.75 and wood for \$ 3.50. How much change should he receive from a \$ 20 bill?
6. April, June, September, and November have each 30 days. How many hours in these months all together?
7. What is the cost of 288 oranges at 36 cents a dozen?
8. What number multiplied by 70 will make 1330?

1. When steak costs 18¢ a pound, a half pound costs —— cents. $1\frac{1}{2}$ pounds cost 9¢ + 18¢ or —— cents.
What would $2\frac{1}{2}$ pounds cost? $3\frac{1}{2}$ pounds?

2. When sugar is 6 cents a pound, $3\frac{1}{2}$ pounds cost $3\frac{1}{2}$ times 6 cents, or —— cents. ($3 \times 6 = 18$. $\frac{1}{2}$ of $6 = 3$. $18 + 3 = ?$)

3. What is the cost of $4\frac{1}{2}$ gal. of oil at 12¢ a gallon?

4. How many feet in 7 yd.? In $\frac{1}{3}$ yd.? In $7\frac{2}{3}$ yd.?

5. In 1 da. there are —— hr. In $\frac{3}{4}$ da. there are —— hr. In $1\frac{3}{4}$ da. there are —— hr.

Written

1. How many hours are there in $9\frac{2}{3}$ days?

$$\begin{array}{r} 24 \\ 9\frac{2}{3} \\ \hline 16 \\ 216 \\ \hline 232 \end{array}$$

No. of hr. in $\frac{2}{3}$ da. ($\frac{2}{3}$ of $24 = 16$)
No. of hr. in 9 da.
No. of hr. in $9\frac{2}{3}$ da. *Answer.*

2. Find how many hours in $21\frac{3}{4}$ days.

3. $32 \times 5\frac{3}{4}$

4. $21 \times 8\frac{2}{3}$

5. $485 \times 1\frac{1}{5}$

6. $485 \times 1\frac{2}{5}$

7. $485 \times 7\frac{4}{5}$

8. $252 \times 1\frac{1}{7}$

9. $252 \times 1\frac{3}{7}$

10. $252 \times 5\frac{3}{7}$

11. $84 \times 16\frac{1}{2}$

12. $24 \times 7\frac{5}{6}$

13. $205 \times 9\frac{4}{5}$

14. $336 \times 6\frac{4}{7}$

15. $485 \times 4\frac{2}{5}$

16. $204 \times 8\frac{1}{6}$

17. $136 \times 2\frac{3}{8}$

1. How many hours in 90 minutes?
2. How many seconds in $2\frac{1}{3}$ minutes?
3. What will 3 qt. of vinegar cost at \$.20 a gallon?
4. Give the multiplication tables of 7, 8, and 9.
5. Give the division tables of 7, 8, and 9.
6. Give the multiplication tables of 10, 11, and 12.
7. Give the division tables of 10, 11, and 12.
8. How many pecks in 3 bu. 3 pk.?
9. How many quarts in 3 pk. 3 qt.?
10. What will 18 lemons cost at \$.24 a dozen?
11. George sold 10 White Leghorn eggs and 14 Plymouth Rock eggs at \$.30 a dozen. How much did he receive for them?

Written

1. Divide 8487 by 41.

$$\begin{array}{r} 207 \\ 41\overline{)8487} \\ \underline{82} \\ 287 \\ 287 \end{array}$$

28 tens will not contain 41 any tens' times, so we put 0 in tens' place in the quotient and bring down 7 units. 287 contains 41 seven times.

In these examples, think first what the guide figure is:

2. $21112 \div 52$
3. $61676 \div 68$
4. $41457 \div 39$
5. $70224 \div 28$
6. $5377 \div 19$
7. $21137 \div 23$
8. $56160 \div 27$
9. $399294 \div 42$
10. $470564 \div 94$
11. How many ounces in $6\frac{1}{2}$ lb.?
12. Subtract the sum of 486 and 296 from 1000.

1. Albert has $42 in the bank. Franz has $2\frac{1}{2}$ times as much. *a.* How many dollars has Franz? *b.* How many dollars have both?

2. A boy whose age is now 12 years was born in what year?

3. If a boy earns $.48 in a week, what does he earn in 9 days at the same rate?

4. If a dozen pencils cost 18 cents, what must be paid for a box holding 6 dozen pencils? For 4 boxes?

5. A fruit dealer bought 32 boxes of berries for $2.56. *a.* How much did 1 box cost? *b.* He sold them at 10¢ a box. Did he gain or lose, and how much on 1 box? *c.* On all the boxes?

6. A lame boy rode on the car to and from school every day. His fare was 3 cents each way. *a.* What was his car fare for a week? *b.* If he was absent 5 days in a term of 20 weeks, how much was his car fare for the term?

7. If a street car makes 15 trips a day and carries 45 passengers each trip, how many passengers are carried during the day?

8. Columbus discovered America in the year 1492. How long ago was that?

9. If a man earns $95 a month and spends $35 a month, how much does he save in a year?

10. 31 and 13 are the factors of what number?

11. A door mat 24 in. by 36 in. covers how many square inches of the floor?

423,578,600 is read, *four hundred twenty-three million five hundred seventy-eight thousand six hundred.*

1. *Read:* 125,791,235; 26,625,130; 4,310,240; 99,000,000; 600,329,842; 100,000,125; 96,000,050.

Find results and read them:

2. *Multiply by* 10: 14; 28; 79; 192; 345.
3. *Multiply by* 100: 210; 980; 6004; 4250.
4. *Multiply by* 1000: 13; 25; 49; 324; 20.
5. *Divide by* 1000: 98,000; 1,239,000; 4,900,000.
6. 569×3200
7. 423×600
8. 507×500
9. 938×240
10. 5803×9000
11. 256×8500
12. 2038×490
13. 950×2400
14. $3{,}812{,}400 \div 900$
15. $180{,}960 \div 520$
16. $50{,}040 \div 60$
17. $308{,}000 \div 800$

18. The sun is 92,000,000 miles from the earth. *a.* If you could travel toward the sun at the rate of 40 miles an hour, you would have to travel how many hours to reach it? *b.* If you should travel 10 hours a day, how many days must you travel to reach the sun?

19. It is 25,000 miles around the earth. If you travel 50 miles an hour, how many hours must you travel to go around the earth?

1. *How long will it take you to get correct sums?*

a.	*b.*	*c.*	*d.*	*e.*
837	628	8063	$26.43	$715.30
2964	4307	259	18.75	21.86
418	526	8264	2.93	9.24
3825	8279	1287	4.10	10.16
842	428	428	128.06	7.28
29	4273	3064	563.13	516.00

2. A jar of butter containing $23\frac{1}{2}$ lb. costs how much at 30 ¢ a pound?

3. At $96 a month, how much can a man earn in $7\frac{1}{2}$ months?

4. How many quarts in $6\frac{1}{8}$ bushels?

5. At $1.28 a yard, what will $3\frac{3}{8}$ yd. of cloth cost?

6. How many minutes in $7\frac{4}{5}$ hours?

7.	8.	9.	10.	11.
5000	$40.12	$25.00	$38.42	495
−479	−37.84	− ?	+ ?	× 99
		$23.59	$96.39	

Oral

1. Name all the letters used in Roman notation and give the value of each.

2. Read 240, 361, 405; 1,072, 610.

3. Count by 7's from 3 to 87.

4. Read CXVII.

5. How many dozen are 108 eggs?

There are **2000 pounds** in one **ton** (T.).

One horse can draw a ton of coal. A two-horse load of coal usually contains two tons. Farmers usually take to market about one ton of hay at a load.

A large flagstone may weigh about one ton. Can you name something else that weighs about one ton?

1. How many pounds in 2 T. of coal? In $1\frac{1}{2}$ tons? In 12 tons? In $\frac{3}{4}$ of a ton? In $\frac{1}{2}$ ton? In $\frac{1}{20}$ of a ton? In $6\frac{1}{2}$ tons?

2. A load of iron rails weighs 3 tons. The wagon weighs 1250 lb. The horses weigh 2600 lb. The bridge that the load is drawn across must be strong enough to hold up —— pounds.

3. A car load of coal weighs 28000 lb. How many wagon loads of 2 T. each will it make?

4. Mrs. Allen bought a quarter of a ton of coal. How many pounds did she buy?

5. A ton of butter was packed in pails holding 50 lb. each. How many pails were used?

6. 20 bales of cotton, each containing 500 lb., weigh how many pounds? How many tons?

7. 1000 lb. is what part of a ton? 500 lb.? 200 lb.?

8. How many pounds in 5 T.? 7 T.? 21 T.? $\frac{3}{4}$ T.?

9. How many ounces in 1 ton? In 7 T.? In $\frac{3}{4}$ T.?

10. A ton of hay was pressed into bales weighing 200 pounds apiece. *a.* How many bales were there? *b.* How many such bales would $7\frac{1}{2}$ tons make? *c.* $11\frac{3}{5}$ tons?

1. Division is often indicated by writing the *dividend above* a line and the *divisor below* the same line, thus: $\frac{12}{3} = 12 \div 3 = 4$; $\frac{15}{5} = 3$; $\frac{30}{6} =$ ——; $\frac{48}{12} =$ ——; $\frac{72}{9} =$ ——.

2. Give the quotients: $\frac{45}{5}$; $\frac{81}{9}$; $\frac{144}{12}$; $\frac{240}{10}$; $\frac{69}{3}$; $\frac{220}{20}$.

3. When the dividend does not contain the divisor an exact number of times, the *remainder* is written *over* the *divisor*, as a *fraction*, thus $\frac{38}{9} = 4\frac{2}{9}$. This means that there are four 9's in 38, and 2 over, or, that the quotient of 38 divided by 9 is $4\frac{2}{9}$.

Find the quotients: $\frac{13}{2}$; $\frac{14}{3}$; $\frac{21}{4}$; $\frac{16}{3}$; $\frac{23}{4}$; $\frac{83}{9}$; $\frac{113}{16}$; $\frac{45}{10}$.

4. At 40 cents a pound, what is the cost of $\frac{1}{2}$ lb. of peppermints and $\frac{1}{4}$ lb. of lemon drops?

Written

1. Divide 26670 by 35.

$$
\begin{array}{r|l}
 & 762 \\
35 & 26670 \\
 & 245 \\
 & \hline
 & 217 \\
 & 210 \\
 & \hline
 & 70 \\
 & 70
\end{array}
$$

35 is midway between 30 and 40. 3 is contained in 26 eight times. 4 is contained in 26 six times. So the first quotient figure is between 6 and 8, or 7. In a similar manner we get 6 for the second figure of the quotient.

2. $8675 \div 25$ (use 2 and 3 for guide figures).

3. $3082 \div 46$ (use 4 and 5 for guide figures).

Find the quotients:[1]

4. $\frac{2210}{65}$ 5. $\frac{2035}{55}$ 6. $\frac{2700}{75}$ 7. $\frac{3445}{65}$ 8. $\frac{875}{35}$

9. $\frac{1890}{45}$ 10. $\frac{2788}{34}$ 11. $\frac{3315}{85}$ 12. $\frac{33488}{46}$ 13. $\frac{51595}{85}$

[1] Examples 4 to 13 should be read, "2210 divided by 65," etc.

1. On the blackboard, make a square 1 ft. wide. How long is it? What is it called? Describe a square foot.

2. Make a rectangle 3 ft. by 7 ft. How many square feet (*sq. ft.*) does it contain? Mark off the square feet in the rectangle.

3. How many square feet in an oblong 9 ft. by 8 ft.? 7 ft. by 12 ft.? 11 ft. by 12 ft.? 6 ft. by 7 ft.?

4. Measure the length and breadth of your schoolroom and find the number of square feet in the floor.

NOTE. — Length and breadth are dimensions.

5. The floors in our house are rectangles and have the following dimensions:

Reception room	12 ft. by $11\frac{1}{2}$ ft.
Dining room	13 ft. by 16 ft.
Library	18 ft. by 13 ft.
Hall	8 ft. by 18 ft.
Kitchen	$12\frac{1}{2}$ ft. by 14 ft.

a. Find the number of square feet in each of the floors. *b.* In all the floors. Draw the hall, using $\frac{1}{4}$ in. for 1 ft.

6. Measure the top of your desk and find the number of square inches it contains. (Omit fractions.)

7. Mr. Fancher's sidewalk is 5 ft. wide and 66 ft. long. What did it cost at 11 ¢ per square foot?

8. What would it cost to put an oak floor in the library (question 5) at 17 ¢ per square foot?

9. A skating rink 98 ft. by 212 ft. contains how many square feet? Find its perimeter.

1. Hold your hands 1 yd. apart. Hold your hand one yard above the floor. Without a rule, draw on the blackboard a square one yard long. How wide is it? Measure and correct it. What is it called? Describe a **square yard.**

2. The top of your teacher's desk contains about how many square yards (*sq. yd.*)?

3. Estimate the number of square yards in the floor of your schoolroom. Measure and see how nearly right you are.

4. A courtyard is 12 yd. wide and 43 yd. long. How much would it cost to pave it at $\$2\frac{1}{2}$ a square yard?

5. The number of square units (*square yards, square feet, square inches,* etc.) that a surface contains is its **area.** How do we find the *area* of a rectangle?

6. When the area and one dimension of a rectangle are given, how can we find the other dimension?

7. The area of a dining table is 36 sq. ft. Its width is 4 ft. What is its length? Draw it, using $\frac{1}{2}$ in. for 1 ft.

8. A pane of glass is 28 in. by 32 in. *a.* What is its area? *b.* A room with 3 windows, each having 2 such panes, has how many square inches of glass?

9. Measure a floor in your house and compute the area. Make a drawing, using $\frac{1}{4}$ in. for 1 ft.

10. There are 5280 ft. in a mile. If a pavement is a mile long and 50 ft. wide, how many square feet in it?

11. A mile is 1760 yd. How many square yards in a street 1 mile by 20 yd.?

1. Find the value of $\frac{29366}{49}$.

$599\frac{15}{49}$ *Quotient*

$$\begin{array}{r} 49\overline{)29366} \\ 245 \\ \hline 486 \\ 441 \\ \hline 456 \\ 441 \\ \hline 15 \end{array}$$

PROOF

$$\begin{array}{rl} 599\frac{15}{49} & \textit{Quotient} \\ \times\ 49 & \textit{Divisor} \\ \hline 5391 & \\ 2396 & \\ \hline 29351 & \\ +\ 15 & \textit{Remainder} \\ \hline 29366 & \textit{Dividend} \end{array}$$

There is a remainder of 15, which shows that 29366 is 15 more than the product of 599 and 49.

Find the values of the following. Test your work by multiplying the whole number in the quotient by the divisor, and adding the remainder.

2. $\frac{27938}{57}$	3. $\frac{6294}{83}$	4. $\frac{7209}{18}$	5. $\frac{6420}{42}$
6. $\frac{7483}{56}$	7. $\frac{18736}{54}$	8. $\frac{56803}{92}$	9. $\frac{9063}{50}$
10. $\frac{6284}{59}$	11. $\frac{92307}{36}$	12. $\frac{53124}{72}$	13. $\frac{9650}{87}$
14. $\frac{6004}{29}$	15. $\frac{37561}{46}$	16. $\frac{25964}{38}$	17. $\frac{8329}{31}$
18. $\frac{40136}{24}$	19. $\frac{50601}{87}$	20. $\frac{80319}{75}$	21. $\frac{29006}{27}$
22. $\frac{57764}{28}$	23. $\frac{14245}{35}$	24. $\frac{71500}{69}$	25. $\frac{11988}{14}$
26. $\frac{64188}{33}$	27. $\frac{41213}{13}$	28. $\frac{5681}{15}$	
29. $\frac{31053}{65}$	30. $\frac{888}{12}$	31. $\frac{27685}{16}$	

32. If 47 apples will fill a peck measure, how many peck measures will 4356 apples fill, and how many apples will be left over?

33. 2000 ounces of raisins will fill how many pound packages?

1. Count by 3's from 2 to 101 and back.

2. 33 Brazil nuts were given to a boy and his two sisters. How many apiece had they, if the nuts were divided equally?

3. Joseph raised 42 ducks and sold 15. How many had he left?

4. A half-dollar, two quarters, a dime, and two nickels are how much money?

5. A man earned $32. He paid $12 for a suit and $9 for an overcoat. How much had he left?

6. What must be paid for 4 dozen peaches at 2¢ each?

7. $1\frac{1}{2}$ in. + $2\frac{1}{4}$ in. = ? in.; $\$1\frac{3}{4} + \$1\frac{1}{4} = ?$

8. Mr. Finch picked 39 plums and divided them equally among his three sons. How many did Frank and George receive?

Written

1. $41.72 × 8

2. $86.05 × 6

3. $32.65 − 14.87

4. $48.37 − ? = $19.48

5. A man earns $20 a week. If he pays $.95 a day for board and $1.15 a day for other things, how much can he save in a week?

6. Divide the product of 27 and 32 by their sum.

7. A man sold 58 cows at $38 apiece and 176 sheep at $4 apiece. What did he receive for all?

8. One factor of 7659 is 37. What is the other?

9. $\frac{4360}{40}$ 10. $\frac{9480}{30}$ 11. $\frac{301000}{700}$ 12. $\frac{15779}{31}$

1. A dressmaker bought $4\frac{3}{4}$ dozen buttons. When she has used 20 of them, how many are left?

2. $\frac{19+7+8+6}{10}=?$ $\frac{12+6-8}{5}=?$

3. What does a year's rent amount to at $12 a month?

4. What is the amount of 6 months' rent at $120 a year? Can you find it in two ways?

5. 3 yd. of gas pipe at 8 cents a foot cost how much?

6. ——× ——= 84. ——× ——= 132.

7. Six feet of chain at $.36 a yard cost how much?

8. The multiplicand is 42, the multiplier 2. What is the product? Make a problem.

Written

1. Mr. Graves receives a salary of $1404 per year. That is how much a month?

2. A farmer sold a grocer 235 lb. of butter at $.24 a pound and bought of the grocer a barrel of sugar for $15.75. Which man received some money and how much?

3. How many bushels of wheat will a farmer raise in $7\frac{1}{2}$ years if he raises 98 bushels every year?

4. A sidewalk 5 ft. wide contains 485 sq. ft. How long is it?

5. 37 and 459 are the factors of what number?

6. How many tons of coal can be put in a bin that will hold 28000 pounds?

7. Write in words 400,216.

1. From a piece of meat weighing 30 ounces, $\frac{3}{4}$ of a pound was cut. How many ounces remained?

2. Hazel paid 16 cents for buttons at 24 cents a dozen. How many did she buy? How many could she buy for 12 cents?

3. A rectangle contains 54 square yards. It is 9 yd. long. Give the question.

4. Charlotte practices music three hours every day. What part of all the time does she practice?

5. What part of a minute is 12 seconds?

6. Give two factors of 63; of 96; of 110; of 32; of 48.

7. Our family uses a half gallon of milk every day at \$.05 a quart. Give the question and answer.

Written

1. Multiply CLXIX by XCV, expressing the work in figures.

2. Two boys sold extracts and shared the profits equally. The first week they took in \$17.25. Their extracts cost them \$9.55. How much did each boy make?

3. Mr. Banker bought a pony for \$142, a cart for \$25, a harness for \$13.50, and robes, blankets, etc., for \$19.75. What did they all cost?

In examples **4–13,** *find the values and test your work:*

4. $\frac{3486}{19}$ 5. $\frac{97603}{23}$ 6. $\frac{15789}{65}$ 7. $\frac{84936}{93}$ 8. $\frac{47630}{88}$

9. $\frac{12903}{66}$ 10. $\frac{12750}{125}$ 11. $\frac{82493}{53}$ 12. $\frac{2835}{62}$ 13. $\frac{4391}{59}$

14. \$459.62 − \$78.36 15. 463×847

1. Without measuring, draw a line 4 in. long; measure and correct it; a line 9 in. long; 12 in.; 2 yd.; $1\frac{1}{2}$ ft.

2. Estimate the width and height of doors, windows, blackboards, ventilators, etc., then measure and see who is most nearly correct.

3. A bushel and 9 qt. are how many quarts?

4. $\frac{1}{2}$ in. = how many fourths of an inch? (Use a rule.)

5. Make the table of 9's in multiplication.

6. What is the time when the minute hand is at IX and the hour hand is between XI and XII? (Picture.)

7. Express in words: MDC; CDLX; DCXC.

Written

1. *Add up, then down. Time yourself:*

a.	*b.*	*c.*	*d.*	*e.*
123	\$ 6.34	903	4836	\$ 5.86
12	83.59	74	539	9.73
3	12.70	973	46	81.29
456	893.98	460	930	40.00
89	24.57	23	89	1.72
45	806.93	58	98	19.38

2. Indicate the sum of 921 and 33 divided by 106.

3. Indicate the product of 1728 and 144 less 5184.

4. *a.* How many pounds in $\frac{3}{8}$ of a ton of corn meal? *b.* What is it worth at \$ 28.64 a ton?

5. When hops are \$ .25 a pound, what should a farmer receive for 3000 lb. of hops?

6. Find the value of: *a.* $\frac{94376}{91}$; *b.* $\frac{4689}{46}$; *c.* $\frac{26325}{65}$.

1. What will 2 yd. of cloth cost if 6 yd. cost 48 cents?

2. If your horse eats 12 qt. of oats a day, how long will $1\frac{1}{2}$ bu. last?

3. How many right angles in 11 rectangles?

4. How much must a man put in the bank each month to save \$ 96 in a year?

5. A boy received a quarter of a dollar a week for driving a farmer's cows to pasture. How much could he earn in 16 weeks?

6. A quart is what part of a gallon? 3 quarts?

7. What must be paid for 8 cream puffs when 4 cost 12 cents? (Two ways.)

8. It takes Willis 5 weeks to earn 10 dollars. In what time can he earn 18 dollars?

Written

1. Without partial products, find 83×11; 421×11.

2. By short division, find the value of: *a.* $\frac{913}{11}$; *b.* $\frac{781}{11}$; *c.* $\frac{4477}{11}$; *d.* $\frac{4224}{11}$.

3. If Mr. Kent works 300 days in a year at \$4 per day, how much will he earn in 11 years?

4. Without partial products, find: *a.* 186×12; *b.* 435×12; *c.* 9128×12.

5. By short division, find: *a.* $\frac{2472}{12}$; *b.* $\frac{11100}{12}$; *c.* $\frac{9756}{12}$.

6. How many years and months in 964 months?

7. A park is 240 yd. long. How wide must it be to contain 4320 square yards?

1. How many feet in all the sides of a square yard? (Draw it on the blackboard.)

2. $\frac{9}{12}\frac{9}{2} = \text{——}$; $\frac{8}{11}\frac{7}{} = \text{——}$; $\frac{3}{18}\frac{6}{} = \text{——}$; $\frac{4}{15}\frac{5}{} = \text{——}$.

3. $\frac{18}{9} = \text{——}$; $\frac{18 \times 5}{9 \times 5} = \text{——}$; $\frac{18 \div 3}{9 \div 3} = \text{——}$.

4. Read 80,306; 100,100; 705,050.

5. How long and wide is a square that contains 16 square inches? (Picture.)

6. If \$10 is $\frac{1}{5}$ of my money, how much money have I?

7. Irving gathered $\frac{1}{2}$ bu. of chestnuts and Horace gathered 5 qt. more than Irving. How many quarts did Horace gather? How many quarts did both gather?

Written

1. There are XXXI chapters in the book of Proverbs, CL in the book of Psalms, and LXVI in the book of Isaiah. How many more chapters are there in the book of Psalms than in both the others together?

2. Two men start from the same place. A travels 59 miles north and B travels 63 miles south. *a.* How far apart are they? *b.* If they had traveled in the same direction, how far apart would they have been. (Picture.)

3. How much greater is $\frac{1}{4}$ of 86,140 than $\frac{1}{5}$ of it?

4. 27,404 has what factor besides 68?

5. The product is 7488. The multiplier is 96. Find the multiplicand. Make a problem.

6. George climbed $\frac{4}{5}$ of the distance to the top of a tree 60 feet high. How far from the ground was he?

TO THE TEACHER

The terms *concrete number* and *abstract number* have become so fixed in arithmetical literature that their propriety, or even their necessity, is scarcely questioned.

A close examination into the nature of number, however, convinces one that number is essentially abstract, and that the name or denomination affixed to a number is no part of the number itself, and is useful merely for the purpose of reference, or as a mark of identification, and therefore should not be brought into the mathematical operations performed with numbers.

Possibly the child's intuitive grasp of this truth has made him so prone to interchange the terms in multiplication, to find the "number of parts" instead of "one of the parts" in division, and to resist the attempt of the teacher to make him use the larger number for the multiplier in explaining a certain class of problems.

Is it not possible, indeed, to add unlike numbers? Is it not as easy to add 6 trees and 7 books as to add 6 trees and 7 trees? We need only to apply the sum to a term sufficiently general and call it 13 things or 13 objects. In either case, the process of addition is performed with the numbers 6 and 7, and not with the objects to which the numbers are applied.

Without prescribing any set form for the analysis of problems, let us suggest that much time and tribulation may be saved by such a treatment of the fundamental operations as the following: —

a. If an apple costs 2 cents and a peach 3 cents, both cost *as many* cents as the sum of *2* and *3*, or five cents.

b. If a boy earns 5 dollars and spends 3 dollars, he saves *as many* dollars as the difference between *5* and *3*, or 2 dollars.

c. Since there are 2 pints in 1 quart, 20 quarts are equal to *as many* pints as the product of *2* and *20*, or 40 pints.

d. Since there are 16 ounces in 1 pound, 32 ounces are equal to *as many* pounds as the quotient of *32 divided by 16*, or 2 pounds.

e. If 5 pencils cost 15 cents, 1 pencil costs *as many* cents as the quotient of *15 divided by 5*, or 3 cents.

This form of analysis recognizes in each case the real nature of number, namely, "that which tells how many," and also the true function of addition, subtraction, multiplication, and division, as operations with *numbers*, not with *things*. It avoids all difficulty as to the likeness or unlikeness of terms in multiplication and division. In every problem involving multiplication, the question itself indicates to the pupil what unit-name is to be attached to the product, and he need only observe that he has two factors to multiply in order to determine the *numerical* product. It is wholly immaterial which factor he uses for the multiplier, or what unit-name either factor may bear. Likewise, in division, the pupil knows at the outset what is to be the unit-name of the quotient, and that the dividend represents a product of which the divisor is one factor, and the other factor is to be found. Whether the dividend and divisor are like or unlike numbers is of no consequence in the solution of the problem or the determination of the result.

It is well, however, to label numbers with their unit-names for convenience in referring to them while solving a problem or reviewing the work.

1. *A number that can be exactly divided by* **2** *is an* **even number,** as, 2, 4, 6, 8, 10.

A number that cannot be exactly divided by **2** *is an* **odd number,** as, 1, 3, 5, 7, 9, 11.

2. Divide 98 by 2. What is the remainder? What kind of a number is 98?

3. Divide 97 by 2. What is the remainder? What kind of a number is 97?

4. Write all the odd numbers from 1 to 99.

5. Write all the even numbers to 100.

6. What are the unit figures in the even numbers? In the odd numbers?

7. At how many figures of a number must you look to tell whether it is odd or even?

8. Tell which of the following numbers are odd and which are even: 9, 12, 16, 15, 14, 27, 19, 36, 438, 591.

9. What factor is always found in an even number?

10. In what kind of a number is the factor 2 never found?

11. *Tell which of the following numbers are odd and which are even:*

The number of

a. Pints in a quart.
b. Cents in a half dime.
c. Quarts in a peck.
d. Minutes in $\frac{1}{4}$ hr.
e. Hours in $\frac{3}{8}$ da.
f. Inches in a foot.
g. Quarts in $\frac{1}{4}$ gal.
h. Eighths in $\frac{1}{4}$.
i. Square inches in a 5-inch square.
j. Quarts in $\frac{5}{8}$ of a bushel.

We have learned that the *multiplier* and *multiplicand* are **factors** of the *product*, and that the *divisor* and *quotient* are **factors** of the *dividend*. If you have the product and one of its factors, how can you find the other factor? If you have the dividend and one of its factors, how can you find the other factor?

One of the numbers that are multiplied to produce a number is a **factor** *of that number.*

So small a number as 2 has factors, for $2 \times 1 = 2$. What are the factors of 2?

In telling the factors of a number, we do not mention the factor 1, because 1 is a factor of every number.

1. Give two factors of 6; 9; 10; 14; 15; 21; 25; 22; 33; 34; 35; 38; 39; 49; 63; 72; 77; 81.

2. Of what number are 12 and 11 factors?

3. $2 \times 3 \times 5 = ?$ Give three factors of 30.

4. $7 \times 2 \times 5 = ?$ Give three factors of 70.

5. Name all the numbers that will divide 9; 8; 10; 11; 12; 13; 14.

6. 5 and 2 are factors of 30. What other factors has 30?

7. Complete the following statements and tell which numbers are products and which are factors:

a. 8 pints = —— quarts.
b. 5 dozen copy books are —— copy books.
c. 4 bushels = —— pecks.
d. 5 apples, at 2 ct. each, cost —— ct.
e. $9 \times$ —— $= 108$.

1. $25 \times 10 = ?$

2. Give two factors of 35.

3. Write the even numbers to 20.

4. There are 120 seconds in 2 minutes. What factor is not given?

5. A sheet of wrapping paper 6 ft. by $2\frac{1}{2}$ ft. contains how many square feet?

6. 20 gallons equal how many quarts?

7. Dan bought a half peck of peanuts at 5 cents a quart. Give the question and answer.

8. The area of a window shade is 21 square feet. Its length is 7 ft. Which number is a product? What are its factors?

9. If you sleep $\frac{3}{8}$ of the time, how many hours a day do you sleep?

10. 20 min. is what part of an hour?

Oral

Complete the following statements and tell which numbers are products and which are factors:

11. 32 ounces are —— pounds.

12. At \$12 a week, a man can earn \$96 in —— weeks.

13. A floor is 12 ft. long and 11 ft. wide. Its area is ——.

14. A man's salary for 10 years amounts to \$15000. He receives —— dollars per year.

15. At 25 cents per week, Roger should receive —— for shoveling Mr. Abel's sidewalk 4 weeks.

1. 12 is what of 4 and 3? When 4 and 3 are given, how can you get 12? When 12 and 4 are given, how can you get 3? When 12 and 3 are given, how can you get 4? 4 and 3 are what of 12?

2. At 7 cents apiece what will 5 pineapples cost? Which numbers are factors? What is the product?

3. If 5 pineapples cost 35 cents, how can you find the cost of 1 pineapple? If 1 pineapple costs 7 cents, how can you find the number of pineapples that 35 cents will buy? 5 and 7 are what of 35? 35 is what of 5 and 7?

4. When two factors are given, what do you do to find the product? When the product and one factor are given, what do you do to find the other factor?

In each of the following problems, tell which of the things mentioned in question **4** *are given, and which is to be found:*

5. What is the area of a rectangle 4 ft. by 9 ft.?

6. If Clarence earns 12 cents every week, in how many weeks will he earn 84 cents?

7. There are 4 pecks in a bushel. How many pecks in 11 bushels?

8. 7 days make a week. How many weeks in 63 days?

9. $4371 \div ? = 47$. 10. $75 \times ? = 2025$. 11. $38 \times 99 = ?$

12. If $5.10 is divided equally among 3 boys, how much money will each receive?

13. An apple tree bore 128 bushels of apples in 16 years. That was the same as how many bushels in each year?

14. One factor of 121 is 11. What is the other?

1. $2 \times 3 = ?$ 6 contains 3 how many times? 6 contains 2 how many times?

2. $3 \times 5 = ?$ 15 contains 3 how many times? 15 contains 5 how many times?

3. $5 \times 7 = ?$ 35 contains 7 how many times? 35 contains 5 how many times?

4. $44 \div 4 = ?$ $44 \div 11 = ?$ 44 is what of 4 and 11?

A number that exactly contains another number is a **multiple** *of that number.*

5. Name a multiple of 2; of 3; of 5; of 7; of 4; of 11.

6. Name two numbers of which 6 is a multiple.

7. Nine is a multiple of what?

8. Every even number is a multiple of what?

9. A number that is not a multiple of 2 is what kind of a number?

10. 6 is a multiple of what two numbers?

11. Give all the multiples of 2 up to 30.

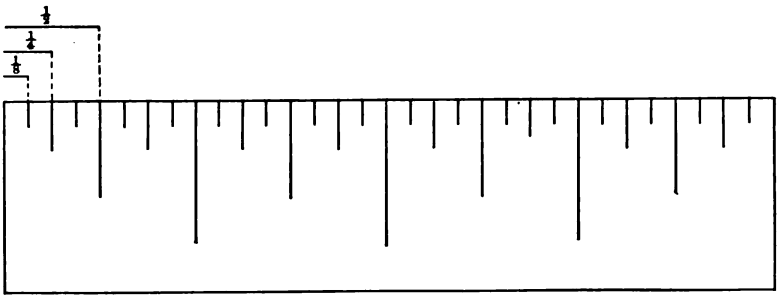
12. Give all the multiples of 3 up to 36; of 5 up to 60; of 4 up to 48; of 6 up to 72; of 7 up to 84.

13. How many different numbers will divide 36?

14. The number of cents that 8 tops will cost at 5¢ apiece is a multiple of what?

15. 77 is a multiple of 7. It is a multiple of what other number?

16. What is the smallest number of apples that you could divide equally among either 3 boys or 2 boys without cutting any of the apples?



1. How many *inch* spaces are there on this rule? How many *half-inch* spaces in 1 inch? In the whole rule?

2. How many $\frac{1}{4}$-*inch* spaces in 1 inch? In the whole rule? In $\frac{1}{2}$ inch? How many quarters in an inch?

3. How many $\frac{1}{8}$-inch spaces in 1 inch? In the whole rule? In $\frac{1}{2}$ inch? In $\frac{1}{4}$ inch?

4. 1 *inch* = how many *half inches?* How many $\frac{1}{4}$ *inches?* How many $\frac{1}{8}$ *inches?* 1 inch = $\frac{?}{2} = \frac{?}{4} = \frac{?}{8}$.

5. How many quarter inches in one half inch? How many $\frac{1}{8}$ inches in one half inch? $\frac{1}{2}$ inch = $\frac{?}{4} = \frac{?}{8}$.

6. How many $\frac{1}{8}$ inches in $\frac{1}{4}$ inch? $\frac{1}{4}$ inch = $\frac{?}{8}$.

7. Two half inches are how many inches? 4 half inches? 6 half inches? 8 half inches? 3 half inches?

8. $\frac{2}{8} = \frac{1}{?}$; $\frac{4}{8} = \frac{1}{?}$; $\frac{8}{8}$ make what; $\frac{2}{4} = \frac{1}{?}$; $\frac{4}{4}$ make what?

9. $\frac{1}{2}$ inch and $\frac{1}{4}$ inch make $\frac{?}{4}$ inch; $\frac{1}{2} + \frac{1}{4} = ?$

10. $\frac{1}{4}$ inch and $\frac{1}{8}$ inch make $\frac{?}{8}$ inch; $\frac{1}{4} + \frac{1}{8} = ?$

11. $\frac{1}{2}$ inch and $\frac{1}{8}$ inch make $\frac{?}{8}$ inch; $\frac{1}{2} + \frac{1}{8} = ?$

12. $\frac{1}{2}$ inch and $\frac{1}{4}$ inch make $\frac{?}{8}$ inch; $\frac{1}{2} + \frac{1}{4} = \frac{?}{8}$.

13. Which is greater $\frac{1}{2}$ or $\frac{1}{4}$? $\frac{1}{4}$ or $\frac{1}{8}$? $\frac{1}{4}$ or $\frac{2}{8}$? $\frac{1}{2}$ or $\frac{2}{4}$?

1. On the rule (p. 142), find $\frac{1}{2}+\frac{1}{2}$; $\frac{1}{4}+\frac{1}{4}$; $\frac{1}{8}+\frac{1}{8}$; $1\frac{1}{2}+\frac{1}{2}$; $3\frac{1}{2}+\frac{1}{2}$; $1\frac{1}{2}+2\frac{1}{2}$.

NOTE. — Children use their own rules also.

2. Find $1\frac{1}{4}+\frac{1}{4}$; $1\frac{1}{4}+2\frac{1}{4}$; $1\frac{1}{2}+\frac{1}{2}$; $1\frac{3}{4}+\frac{1}{4}$; $1\frac{3}{4}+\frac{1}{2}$.

3. Find $1\frac{3}{4}$, then take away $\frac{1}{4}$. What is left?

4. Find $2\frac{3}{4}$, then take away $\frac{1}{2}$. What is left?

5. $2+3=?$ $\frac{1}{2}+\frac{1}{2}=?$ $2\frac{1}{2}+3\frac{1}{2}=?$ $\frac{1}{2}+\frac{1}{4}=?$ $5\frac{1}{2}+\frac{1}{4}=?$

6. $\frac{3}{4}+\frac{1}{4}=?$ $6+2=?$ $6\frac{3}{4}+2\frac{1}{4}=?$ $5\frac{3}{4}-\frac{1}{4}=?$ $7\frac{1}{2}-\frac{1}{2}=?$

7. Mary has a hand mirror 4 in. by $6\frac{1}{2}$ in. How many square inches does it contain? (Picture.)

8. If the mirror was 3 in. wide and contained 15 sq. in., how long would it be? (Picture.)

9. A traveler paid \$.25 for breakfast, \$.50 for dinner, \$.25 for supper, and \$.50 for lodging. What did his board and lodging for the day cost him?

10. If 5 pears cost 15 cents, 10 pears will cost twice as much, or —— cents. Why?

11. 20 pencils cost 60 cents. Five pencils cost $\frac{1}{4}$ as much, or —— cents. Why? In what other way could you get it?

12. If 2 quarts of milk cost 10 cents, 2 gallons would cost —— times as much, or —— cents. Why?

13. Henry earned 40 cents in 5 hours. How much could he earn in 10 hours? Find it in two ways.

14. Grace can solve 4 problems in 12 minutes. How many can she solve in 48 minutes? Find it in two ways.

15. At 2 cents a foot, what will 6 yd. 2 ft. of rope cost?

1. *a.* 24×10	2. *a.* 12×70	3. *a.* 46×20
b. 45×100	*b.* 16×30	*b.* 15×40
c. 16×20	*c.* 420×20	*c.* 12×600
d. 18×20	*d.* 51×100	*d.* 15×50
e. 30×10	*e.* 7×1000	*e.* 90×100
4. *a.* $160 \div 10$	5. *a.* $80 \div 40$	6. *a.* $600 \div 300$
b. $230 \div 10$	*b.* $280 \div 40$	*b.* $800 \div 200$
c. $40 \div 20$	*c.* $250 \div 50$	*c.* $1800 \div 900$
d. $80 \div 20$	*d.* $420 \div 70$	*d.* $36000 \div 9000$
e. $100 \div 20$	*e.* $860 \div 20$	*e.* $720 \div 120$

7. A pail weighs $1\frac{3}{4}$ pounds, the cover $\frac{1}{4}$ pound, and the contents of the pail 20 pounds. If you carry it, how many pounds must you carry?

8. If George gained $5\frac{3}{4}$ lb. during vacation and lost $\frac{1}{2}$ lb. during the first week of school, how much heavier was he then, than when the vacation began?

ADDITION AND SUBTRACTION

9. *a.* $2\frac{1}{2}+\frac{1}{2}$	10. *a.* $7\frac{1}{4}+3\frac{1}{4}$	11. *a.* $2\frac{3}{4}+9\frac{1}{4}$
b. $3\frac{1}{2}+1\frac{1}{2}$	*b.* $5\frac{3}{4}+1\frac{1}{4}$	*b.* $6\frac{1}{2}-\frac{1}{2}$
c. $7\frac{1}{2}+8\frac{1}{2}$	*c.* $2\frac{5}{8}+\frac{3}{8}$	*c.* $7-\frac{1}{2}$
d. $4\frac{1}{2}+8\frac{1}{2}$	*d.* $7\frac{1}{2}+\frac{1}{4}$	*d.* $8\frac{1}{2}-3\frac{1}{2}$
e. $6\frac{3}{4}+\frac{1}{4}$	*e.* $8\frac{3}{4}+1\frac{1}{4}$	*e.* $6\frac{3}{4}-\frac{1}{4}$
12. *a.* $5\frac{7}{8}+\frac{1}{8}$	13. *a.* $8\frac{1}{2}-\frac{1}{4}$	14. *a.* $53-29$
b. $6\frac{7}{8}+1\frac{1}{8}$	*b.* $9\frac{3}{4}-\frac{1}{2}$	*b.* $86-79$
c. $7\frac{1}{2}+\frac{1}{4}$	*c.* $8\frac{1}{2}+?=8\frac{3}{4}$	*c.* $65-38$
d. $8\frac{1}{2}+3\frac{1}{4}$	*d.* $5\frac{7}{8}+?=6$	*d.* $59+32$
e. $12\frac{1}{2}+7\frac{1}{2}$	*e.* $4\frac{3}{4}-?=4\frac{1}{2}$	*e.* $86+49$

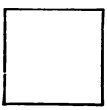


FIG. 1.

FIG. 3.

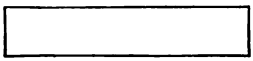


FIG. 2.

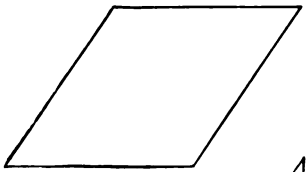


FIG. 4.

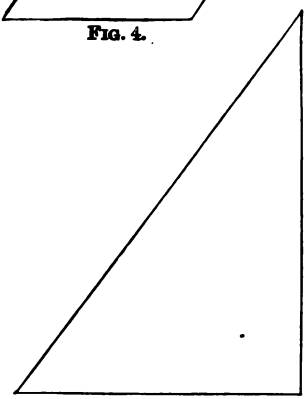


FIG. 5.

The sum of all the sides of a figure is its **perimeter.**

1. Measure the four sides of Figure 4. Add them. What is the perimeter of Figure 4 ?

2. Measure the sides of Figure 5. Find its perimeter.

3. Find the perimeter of Figure 1; of Figure 3; of Figure 2.

4. Draw on the blackboard a square 9 in. on a side. *a.* Its perimeter is how many inches? *b.* How many feet?

5. Draw a square whose perimeter is 48 in. How many inches long and wide must it be?

6. Measure your paper and find its perimeter.

7. Draw on the blackboard a rectangle 2 ft. long and 6 in. wide. Find its perimeter.

8. A garden bed is 12 ft. long and 8 ft. wide. Make a drawing of it, using $\frac{1}{2}$ in. for 1 ft. What is its perimeter?

9. A city lot is 150 ft. long and 50 ft. wide. What is its perimeter? Draw it, using 1 in. for 50 ft.

1. Review page 142.

2. Florence bought $\frac{1}{2}$ lb. of caramels, $\frac{1}{2}$ lb. of peppermints, and $\frac{1}{2}$ lb. of butter scotch. How many pounds of candy did she buy?

3. What are 10 jackknives worth at $\$\frac{1}{2}$ apiece?

4. What are 20 knives worth at $\$\frac{1}{4}$ apiece?

5. Cut a pie into 8 equal pieces. What part of the pie is 1 piece? (Picture.)

How many pies, each cut into 8 pieces, are needed to serve 24 people? $\frac{24}{8} = ?$

6. Cut a pie into quarters. Give a piece to each of two boys. What part of the pie is gone? What part is left? (Picture.) $\frac{2}{4} = ?$

7. Give half a pie to John and $\frac{1}{4}$ to Nellie. What part is gone? What part is left? (Picture.) $\frac{1}{2} = \frac{?}{4}$.

8. Cut a pie into 8 pieces. Give $\frac{1}{2}$ to Henry (How many pieces?) and $\frac{1}{8}$ to Frank. What part is gone? What part is left? (Picture.) $\frac{1}{2} + \frac{1}{8} = \frac{?}{8} + \frac{1}{8} = ?$ $\frac{1}{2} + \frac{3}{8} = ?$ $\frac{1}{4} + \frac{1}{8} = ?$

Make a picture of 4 pies cut into 8ths. Each piece is $\frac{1}{?}$. How many pies do 8 pieces make? 16 pieces? 24 pieces? 32 pieces? $\frac{8}{8} = ?$ $\frac{16}{8} = ?$ $\frac{32}{8} = ?$ $\frac{24}{8} = ?$ 9 pieces make how many pies? 11 pieces? 13 pieces? 15 pieces? 31 pieces? $\frac{9}{8} = ?$ $\frac{13}{8} = ?$ $\frac{15}{8} = ?$ $\frac{31}{8} = ?$ $\frac{19}{8} = ?$ 10 pieces are how many pies? 12 pieces? 18 pieces? 20 pieces? 28 pieces? $\frac{10}{8} = ?$ $\frac{12}{8} = ?$ $\frac{20}{8} = ?$ $\frac{28}{8} = ?$ How many pieces in $\frac{1}{4}$ of a pie? $\frac{1}{2}$? $\frac{3}{4}$? $\frac{1}{4} = \frac{?}{8}$ $\frac{1}{2} = \frac{?}{8}$.

The number written above the line in a fraction is the **numerator.**

The number written below the line in a fraction is the **denominator.**

Name the numerator and the denominator of $\frac{1}{2}$; $\frac{3}{4}$; $\frac{7}{8}$; $\frac{5}{6}$.

The *numerator* and *denominator* are called the **terms of a fraction.** Name the terms of $\frac{7}{8}$; $\frac{14}{15}$; $\frac{11}{13}$.

1. The numerator of a fraction is 5. The denominator is 9. What is the fraction? Write it.

2. What is the fraction whose numerator is 8 and whose denominator is 13? Write it.

3. *A fraction always indicates division.* The numerator is the *dividend.* The *denominator* is the *divisor.*

$\frac{18}{9} = 18 \div 9 = 2$, $\frac{17}{5} = 17 \div 5 = 3\frac{2}{5}$, $\frac{3}{4}$ inch $= 3$ inches $\div 4$.

Draw a line 3 in. long. Divide it into 4 equal parts. Measure one part. How long is it?

Take 3 apples. Cut a quarter out of each one. Put together the 3 quarters cut out. What part of an apple do they make? How does this compare with the part that is left of each apple? The three apples have been divided into how many equal parts?

4. *Express as fractions:* $3 \div 8$; $7 \div 9$; $4 \div 5$; $15 \div 3$; $124 \div 17$.

5. $\frac{18}{9} = 2$, $\frac{18 \div 3}{9 \div 3} = ?$ $\frac{42}{14} = ?$ $\frac{42 \div 2}{14 \div 2} = ?$ $\frac{4}{8} = ?$ $\frac{4 \div 4}{8 \div 4} = ?$

6. Write the fraction whose terms are 3 and 5; 4 and 7; 5 and 8.

1. *A fraction whose terms cannot both be divided by the same number* is in its **lowest terms**. Thus $\frac{2}{3}$ is in its lowest terms, because 2 and 3 cannot both be divided by the same number. $\frac{4}{6}$ is not in its lowest terms, because both 4 and 6 can be divided by the same number. What number will divide 4 and 6?

2. *Tell which of the following fractions are in lowest terms:*

$\frac{1}{2}$, $\frac{2}{3}$, $\frac{2}{4}$, $\frac{3}{6}$, $\frac{3}{4}$, $\frac{5}{9}$, $\frac{3}{9}$, $\frac{7}{9}$, $\frac{6}{9}$, $\frac{5}{10}$, $\frac{7}{10}$, $\frac{5}{11}$, $\frac{8}{12}$, $\frac{7}{12}$, $\frac{9}{12}$.

3. *Change* $\frac{4}{8}$ *to lowest terms:*

$$\frac{4}{8}=\frac{4\div 4}{8\div 4}=\frac{1}{2}.$$ *Answer.*

4. *Change* $\frac{4}{6}$ *to lowest terms:*

$$\frac{4}{6}=\frac{4\div 2}{6\div 2}=?$$ *Answer.*

Change to lowest terms:

5. $\frac{3}{6}$	6. $\frac{6}{8}$	7. $\frac{2}{4}$	8. $\frac{9}{12}$	9. $\frac{4}{12}$	10. $\frac{2}{8}$	11. $\frac{6}{12}$
12. $\frac{7}{14}$	13. $\frac{6}{9}$	14. $\frac{8}{16}$	15. $\frac{3}{12}$	16. $\frac{5}{10}$	17. $\frac{2}{10}$	18. $\frac{6}{10}$
19. $\frac{8}{10}$	20. $\frac{5}{15}$	21. $\frac{3}{15}$	22. $\frac{2}{14}$	23. $\frac{12}{16}$	24. $\frac{14}{16}$	25. $\frac{15}{20}$

ADDITION

1. $\frac{3}{4}+\frac{1}{4}=\frac{4}{4}=1$. $\frac{6}{8}+\frac{2}{8}=\frac{?}{8}=?$ $\frac{4}{5}+\frac{1}{5}=\frac{?}{5}=?$
2. $\frac{3}{4}+\frac{2}{4}+\frac{3}{4}=\frac{8}{4}=2$. $\frac{2}{5}+\frac{1}{5}+\frac{2}{5}=\frac{?}{5}=?$ $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=?$
3. $\frac{2}{3}+\frac{1}{3}=?$ $\frac{4}{5}+\frac{1}{5}=?$ $\frac{3}{6}+\frac{2}{6}+\frac{1}{6}=?$ $\frac{7}{8}+\frac{1}{8}=?$
4. $2\frac{1}{2}+3\frac{1}{2}=5\frac{2}{2}=6$. $6\frac{1}{3}+8\frac{2}{3}=14\frac{3}{3}=?$
5. $3\frac{3}{4}+2\frac{1}{4}=?$ $4\frac{3}{8}+5\frac{5}{8}=?$ $6\frac{7}{8}+\frac{1}{8}=?$
6. $11\frac{2}{3}+\frac{1}{3}=?$ $9\frac{5}{6}+2\frac{1}{6}=?$ $7\frac{3}{5}+2\frac{2}{5}=?$

WHOLE AND MIXED NUMBERS

A number that is not a fraction is a **whole number.** Thus, 5, 8, 10, 11, 15, are whole numbers. Name others.

A whole number and a fraction, taken together, make a **mixed number.** Thus, $2\frac{1}{3}$, $7\frac{2}{5}$, $8\frac{3}{4}$, are mixed numbers.

The value of a fraction whose numerator is larger than its denominator is a **whole** or a **mixed number.**

Thus, $\frac{6}{2}=3$, $\frac{7}{2}=3\frac{1}{2}$, $\frac{12}{3}=4$, $\frac{13}{5}=2\frac{3}{5}$.

How is the value of a fraction found?

Find the value of $\frac{10}{2}$, $\frac{25}{5}$, $\frac{39}{7}$, $\frac{725}{25}$, $\frac{432}{31}$, $\frac{483}{17}$.

Written *

1. *Add* $34\frac{1}{4}$, $42\frac{3}{4}$, 56; $132\frac{4}{4}=133$ *Sum*

2. *Add* $43\frac{3}{8}$, $58\frac{1}{8}$, $62\frac{7}{8}$; $163\frac{11}{8}=164\frac{3}{8}$ *Sum*

3. $36\frac{1}{4}$, $41\frac{3}{4}$, 59

4. $39\frac{2}{3}$, $91\frac{2}{3}$, $85\frac{2}{3}$

5. $48\frac{5}{8}$, 62, $81\frac{3}{8}$

6. $96\frac{1}{2}$, $78\frac{1}{2}$, $82\frac{1}{2}$

7. $235\frac{4}{5}$, $342\frac{4}{5}$, 998

8. $345\frac{3}{4}$, $296\frac{1}{4}$, $408\frac{1}{4}$

9. $99\frac{7}{8}$, $12\frac{3}{8}$, $15\frac{5}{8}$

10. $83\frac{5}{6}$, $49\frac{1}{6}$, 87

11. $12\frac{1}{2}$, $19\frac{1}{2}$, 388

12. $892\frac{3}{4}$, $485\frac{3}{4}$, $207\frac{3}{4}$

13. $49\frac{7}{8}-26\frac{3}{8}$

14. $81\frac{3}{4}-25\frac{2}{4}$

15. $92\frac{2}{3}-86\frac{1}{3}$

16. $237\frac{1}{2}-195\frac{1}{2}$

17. $324\frac{4}{5}-197\frac{3}{5}$

* NOTE. — *In the answer,* when the numerator of a fraction is equal to, or larger than, the denominator, always find the value of the fraction as a whole or a mixed number. Change the fraction part to lowest terms.

NOTE. — Many of these exercises may be illustrated by means of objects and drawings.

1. Add $\frac{3}{4}$ and $\frac{1}{8}$.

$$\frac{3}{4} = \frac{6}{8}$$
$$\frac{1}{8} = \frac{1}{8}$$
$$\frac{7}{8} \textit{ Sum.}$$

2. Add $\frac{3}{4}$ and $\frac{5}{8}$.

$$\frac{3}{4} = \frac{6}{8}$$
$$\frac{5}{8} = \frac{5}{8}$$
$$1\frac{1}{8} = 1\frac{3}{8} \textit{ Sum.}$$

3. Add $12\frac{3}{4}$ and $21\frac{3}{8}$.

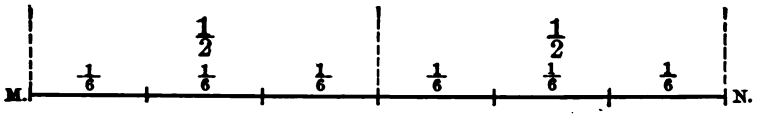
$$12\frac{3}{4} = 12\frac{6}{8}$$
$$21\frac{3}{8} = 21\frac{3}{8}$$
$$33\frac{9}{8} = 34\frac{1}{8} \textit{ Sum.}$$

4. From $18\frac{1}{2}$ take $6\frac{1}{8}$.

$$18\frac{1}{2} = 18\frac{4}{8}$$
$$6\frac{1}{8} = 6\frac{1}{8}$$
$$12\frac{3}{8} \textit{ Remainder.}$$

5. Add $\frac{1}{4}$ and $\frac{1}{8}$.
6. Add $\frac{1}{4}$ and $\frac{3}{8}$.
7. Add $\frac{3}{4}$ and $\frac{7}{8}$.
8. Add $\frac{1}{2}$ and $\frac{3}{4}$.
9. From $\frac{7}{8}$ take $\frac{1}{2}$.
10. From $\frac{1}{2}$ take $\frac{1}{8}$.
11. From $\frac{7}{8}$ take $\frac{1}{4}$.
12. From $\frac{3}{4}$ take $\frac{3}{8}$.
13. From $\frac{7}{8}$ take $\frac{3}{4}$.
14. From $\frac{5}{8}$ take $\frac{1}{4}$.
15. $29\frac{3}{8} + 48\frac{1}{4}$.
16. $37\frac{1}{8} + 81\frac{1}{2}$.
17. $57\frac{3}{4} + 93\frac{3}{8}$.
18. $44\frac{5}{8} + 65\frac{1}{8}$.
19. $64\frac{1}{2} + 23\frac{7}{8}$.
20. $91\frac{7}{8} - 42\frac{1}{2}$.
21. $46\frac{5}{8} - 34\frac{1}{4}$.
22. $83\frac{7}{8} + 21\frac{1}{4}$.
23. $42\frac{3}{4} + 48\frac{1}{2}$.
24. $89\frac{1}{2} + 40\frac{3}{4}$.

25. Alice bought $9\frac{3}{4}$ yd. of silk and $4\frac{1}{4}$ yd. of muslin. How many yards did she buy?



1. How many *halves* in the line MN?

2. How many *sixths* in the line MN?

3. How many sixths in $\frac{1}{2}$ of the line? $\frac{1}{2} = \frac{?}{6}$.

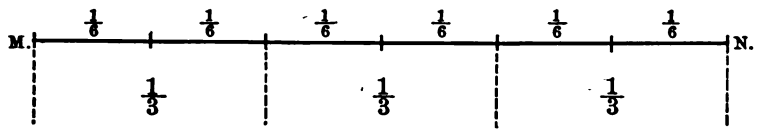
4. Find $\frac{1}{6}$ more than $\frac{1}{2}$ of the line. How many sixths of the line have you found? $\frac{1}{2} + \frac{1}{6} = \frac{3}{6} + \frac{1}{6} = \frac{4}{6}$.

5. Find $\frac{5}{6}$ of the line. $\frac{5}{6}$ of the line is how much more than $\frac{1}{2}$ of the line? $\frac{5}{6} - \frac{1}{2} = \frac{5}{6} - \frac{3}{6} = \frac{2}{6}$.

6. *When we wish to find the differences or sums of halves and sixths, we change the halves to what?*

7. Draw on the blackboard a picture of a pie cut into 6 pieces. Erase $\frac{1}{2}$ of it. How many halves are left? How many sixths are left? Add $\frac{2}{6}$ to the part that is left. What part have you? $\frac{3}{6} + \frac{2}{6} = ?$

8. $\frac{1}{2} + \frac{1}{6} = ?$ $\frac{1}{2} + \frac{3}{6} = ?$ $\frac{1}{2} + \frac{2}{6} = ?$ $\frac{5}{6} - \frac{1}{2} = ?$ $\frac{4}{6} - \frac{1}{2} = ?$

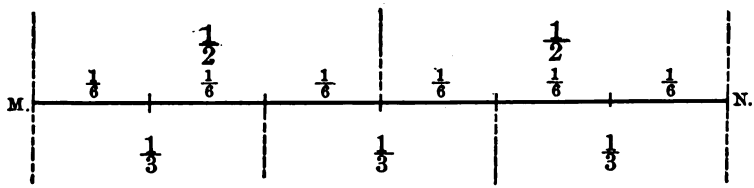


9. $\frac{1}{3}$ = how many 6ths? $\frac{2}{3}$ = how many 6ths?

10. Find $\frac{2}{3}$ and $\frac{1}{6}$ of the line. How many 6ths of the line have you found?

11. $\frac{1}{3} - \frac{1}{6} = \frac{2}{6} - \frac{1}{6} = \frac{1}{6}$. $\frac{1}{3} + \frac{3}{6} = \frac{2}{6} + \frac{3}{6} = \frac{5}{6}$.

12. $\frac{1}{3} + \frac{1}{6} = ?$ $\frac{2}{3} + \frac{1}{6} = ?$ $\frac{5}{6} - \frac{1}{3} = ?$ $\frac{5}{6} - \frac{2}{3} = ?$ $\frac{3}{6} - \frac{1}{3} = ?$



1. By what part of the line MN can you measure both *thirds* and *halves?* $\frac{1}{3}$ = how many sixths? $\frac{1}{2}$ = how many sixths?

2. *To what shall we change halves and thirds when we wish to find their sums or differences?*

3. Find: $\frac{1}{2}+\frac{1}{3}$; $\frac{2}{3}+\frac{1}{2}$; $\frac{2}{3}-\frac{1}{2}$; $\frac{1}{2}-\frac{1}{3}$.

4. $6 \div 2 = ?$ $6 \div 3 = ?$ 6 is what of 2 and 3?

Add:

5. $7\frac{1}{2}$ / $2\frac{1}{6}$
6. $3\frac{1}{3}$ / $5\frac{1}{6}$
7. $4\frac{1}{2}$ / $5\frac{1}{3}$
8. $8\frac{1}{2}$ / $\frac{2}{3}$
9. $6\frac{2}{3}$ / $\frac{1}{6}$

Subtract:

10. $2\frac{5}{6}$ / $\frac{1}{2}$
11. $8\frac{4}{6}$ / $2\frac{1}{3}$
12. $9\frac{1}{2}$ / $2\frac{1}{3}$
13. $6\frac{2}{3}$ / $\frac{1}{2}$
14. $18\frac{5}{6}$ / $8\frac{1}{3}$

Written

Find results:

1. $4\frac{7}{8} + 8\frac{1}{4}$
2. $15\frac{3}{8} + 7\frac{3}{4}$
3. $4\frac{1}{2} + \frac{7}{8}$
4. $8\frac{5}{8} + 2\frac{1}{2}$
5. $47\frac{3}{4} + 16\frac{1}{2}$
6. $135\frac{5}{8} - 10\frac{1}{2}$
7. $49\frac{3}{4} - 16\frac{5}{8}$
8. $99\frac{7}{8} - 15\frac{1}{2}$
9. $432\frac{1}{4} - 129\frac{1}{8}$
10. $467\frac{1}{2} - 288\frac{3}{8}$

Add:

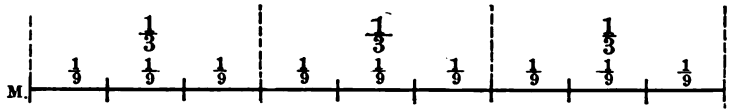
1. $18\frac{1}{2}$	2. $16\frac{1}{3}$	3. $23\frac{1}{6}$	4. $54\frac{1}{2}$	5. $35\frac{1}{2}$
$16\frac{1}{6}$	$19\frac{1}{6}$	$98\frac{2}{3}$	$16\frac{1}{3}$	$42\frac{1}{3}$
6. $17\frac{2}{3}$	7. $39\frac{1}{2}$	8. $72\frac{5}{6}$	9. $46\frac{1}{3}$	10. $83\frac{2}{3}$
$15\frac{5}{6}$	$89\frac{5}{6}$	$81\frac{1}{2}$	$89\frac{5}{6}$	$10\frac{1}{2}$
11. $24\frac{1}{2}$	12. $35\frac{1}{3}$	13. $41\frac{1}{2}$	14. $70\frac{5}{6}$	15. $63\frac{2}{3}$
$12\frac{1}{6}$	$19\frac{1}{6}$	$18\frac{1}{3}$	$18\frac{1}{2}$	$12\frac{1}{2}$
16. $39\frac{5}{6}$	17. $89\frac{2}{3}$	18. $30\frac{5}{6}$	19. $84\frac{1}{4}$	20. $97\frac{5}{8}$
$12\frac{2}{3}$	$29\frac{1}{2}$	$19\frac{1}{3}$	$19\frac{5}{8}$	$16\frac{3}{4}$

Find results:

21. $48\frac{1}{2}$	22. $57\frac{7}{8}$	23. $80\frac{3}{4}$	24. $483\frac{5}{6}$	25. $130\frac{5}{8}$
$-16\frac{1}{4}$	$+81\frac{3}{4}$	$-21\frac{3}{8}$	$+239\frac{2}{3}$	$-21\frac{1}{2}$
26. $231\frac{2}{3}$	27. $437\frac{1}{8}$	28. $380\frac{7}{8}$	29. $42\frac{1}{2}$	30. $46\frac{2}{3}$
$+498\frac{5}{6}$	$+49\frac{3}{4}$	$-18\frac{1}{2}$	$-39\frac{1}{4}$	$+85\frac{2}{3}$

Oral

1. $9-\frac{1}{2}$	2. $7-\frac{1}{3}$	3. $6-\frac{1}{4}$	4. $11-\frac{1}{8}$
5. $14-\frac{2}{3}$	6. $15-\frac{3}{4}$	7. $12-\frac{3}{8}$	8. $16-\frac{5}{8}$
9. $12-2\frac{1}{2}$	10. $14-3\frac{1}{3}$	11. $15-3\frac{1}{6}$	12. $18-1\frac{1}{4}$
13. $6-2\frac{1}{8}$	14. $5-1\frac{2}{3}$	15. $8-5\frac{3}{8}$	16. $9-2\frac{5}{8}$
17. $7-1\frac{7}{8}$	18. $12-3\frac{1}{7}$	19. $14-8\frac{2}{7}$	20. $12-11\frac{7}{8}$



1. $\frac{1}{3}$ = how many ninths?

2. Find $\frac{2}{9}$ more than $\frac{1}{3}$. Can you express it in thirds? How can you express it?

3. Express $\frac{1}{9}$ more than $\frac{2}{3}$. *In order to add thirds and ninths, we change the thirds to what?*

4. $9 \div 3 = ?$ 9 is what of 3?

5. $\frac{1}{3} + \frac{1}{9} =$ ——
6. $\frac{2}{3} + \frac{4}{9} =$ ——
7. $\frac{2}{3} + \frac{2}{9} =$ ——
8. $\frac{1}{3} + \frac{2}{9} =$ ——
9. $\frac{2}{3} + \frac{1}{9} =$ ——
10. $\frac{1}{3} + \frac{5}{9} =$ ——
11. $\frac{2}{3} + \frac{7}{9} =$ ——
12. $\frac{1}{3} + \frac{8}{9} =$ ——
13. $\frac{1}{3} + \frac{4}{9} =$ ——
14. $\frac{8}{9} + \frac{2}{3} =$ ——
15. $\frac{7}{9} + \frac{1}{3} =$ ——
16. $\frac{5}{9} - \frac{1}{3} =$ ——
17. $\frac{8}{9} - \frac{2}{3} =$ ——
18. $\frac{5}{9} + \frac{2}{3} =$ ——
19. $\frac{7}{9} + \frac{1}{3} =$ ——

Subtract:

20. $\frac{7}{9} - \frac{2}{3}$
21. $\frac{1}{3} - \frac{1}{9}$
22. $\frac{2}{3} - \frac{4}{9}$
23. $\frac{1}{3} - \frac{2}{9}$
24. $\frac{8}{9} - \frac{1}{3}$
25. $\frac{2}{3} - \frac{2}{9}$
26. $\frac{2}{3} - \frac{5}{9}$

Written

1. $18\frac{1}{3} + 171\frac{1}{9}$
2. $56\frac{2}{3} + 141\frac{1}{9}$
3. $75\frac{2}{9} + 43\frac{2}{3}$
4. $38\frac{2}{9} + 41\frac{1}{3}$
5. $341\frac{5}{9} + 23\frac{1}{3}$
6. $86\frac{4}{9} + 61\frac{1}{3}$
7. $19\frac{7}{9} + 32\frac{1}{3}$
8. $75\frac{2}{3} + 46\frac{8}{9}$
9. $73\frac{4}{9} + 18\frac{2}{3}$
10. $111\frac{1}{3} + 211\frac{8}{9}$
11. $421\frac{5}{9} + 16\frac{2}{3}$
12. $39\frac{2}{3} + 16\frac{7}{9}$
13. $83\frac{8}{9} - 43\frac{1}{3}$
14. $24\frac{1}{3} - 14\frac{1}{9}$
15. $47\frac{2}{3} - 19\frac{5}{9}$
16. $97\frac{4}{9} - 18\frac{1}{3}$
17. $125\frac{2}{3} - 42\frac{1}{9}$
18. $120\frac{7}{9} - 16\frac{2}{3}$
19. $216\frac{3}{4} - 19\frac{1}{2}$
20. $42\frac{5}{8} - 13\frac{1}{2}$
21. $34\frac{5}{6} - 13\frac{1}{3}$

1. Give the factors of 6; 8; 9; 15; 21; 33; 35; 39.

2. Name the multiples of 7 to 84.

3. What three factors, multiplied together, will produce 30? 18? 40? 42?

4. Give four numbers that are factors of 12.

5. A conductor took up $1.00 in 5-cent fares. He collected from how many people?

6. 8 oz. is what part of 2 lb.?

7. $200 \div 10 = ?$ 8. $56 \times 10 = ?$ 9. $4300 \div 100 = ?$

10. 3 pk. 3 qt. are how many qt.?

11. What must be paid for $2\frac{1}{2}$ qt. of berries at 12¢ per quart?

12. Even numbers are multiples of what?

Written

1. *Add up, then down. Time yourself:*

a.	*b.*	*c.*	*d.*
461	$32.15	9342	931
350	14.63	8675	49
98	2.75	4038	867
233	3.81	5216	423
57	54.29	7879	78
476	6.38	4632	961
92	7.93	184	28

2. 436×251 3. 429×807 4. 906×583

5. 638×246 6. 1132×406 7. 9381×305

8. Divide 4725 by 63 and test your work.

1. Find the cost of $1\frac{1}{2}$ lb. of candy at 2¢ an ounce.

2. Find the cost of $1\frac{1}{8}$ lb. of ginger at 2¢ an ounce.

3. Five boys share equally 1 lb. 9 oz. of candy. What is each boy's share?

4. 6 ft. + 2 ft. + 4 ft. = how many yards?

5. How many square inches in a rectangle 6 in. by $2\frac{1}{2}$ in.? In a rectangle 8 in. by $3\frac{3}{4}$ in.?

6. Leah bought $\frac{3}{4}$ yd. of muslin and used $\frac{3}{8}$ yd. for her doll. How much remained?

7. Wallace gave $\frac{1}{2}$ of his candy to Charles and $\frac{1}{3}$ of it to Harold. What part of his candy did he give away? What part did he keep?

Written

1. At $1.55 a yard, what will 64 yd. of carpet cost?

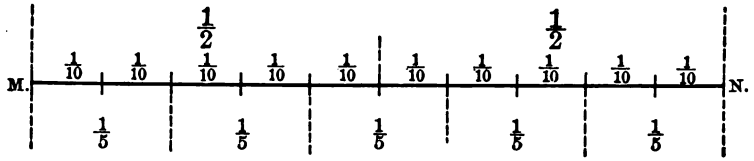
2. Two boys skate in the same direction. One goes 65 yd., the other 3 times as far. How far apart are they? (Picture.)

3. How many yards and feet in the perimeter of a floor 20 ft. by 15 ft.? (Picture.)

4. Hubert found $58\frac{7}{8}$ inches of rubber pipe and used $19\frac{1}{4}$ inches of it for his air pump. How much remained?

5. A pine tree measures $39\frac{7}{8}$ in. around. Five years ago, it measured $28\frac{3}{4}$ inches. How much has the measure increased?

6. If $3\frac{5}{8}$ yd. of ribbon are cut from $11\frac{3}{4}$ yd., how much remains?



1. How many tenths are there in $\frac{1}{2}$?

2. How many tenths in $\frac{1}{5}$? In $\frac{2}{5}$? In $\frac{3}{5}$? In $\frac{4}{5}$?

3. $\frac{1}{2} = \frac{?}{10}$; $\frac{1}{5} = \frac{?}{10}$; $\frac{2}{5} = \frac{?}{10}$; $\frac{3}{5} = \frac{?}{10}$; $\frac{4}{5} = \frac{?}{10}$.

4. *In order to add fifths and halves what must we do first?* $10 \div 2 = ?$ $10 \div 5 = ?$ 10 is what of 5 and 2?

5. $\frac{1}{5} + \frac{1}{2} =$ ——. 6. $\frac{1}{2} + \frac{2}{5} =$ ——. 7. $\frac{1}{2} + \frac{3}{5} =$ ——.

8. $\frac{1}{2} + \frac{4}{5} =$ ——. 9. $\frac{1}{2} - \frac{1}{5} =$ ——. 10. $\frac{4}{5} - \frac{1}{2} =$ ——.

11. $\frac{1}{2} - \frac{2}{5} =$ ——. 12. $\frac{3}{5} - \frac{1}{2} =$ ——. 13. $\frac{4}{5} + \frac{1}{2} =$ ——.

14. $\frac{1}{2} + \frac{5}{5} =$ ——. 15. $3\frac{1}{2} + 5\frac{2}{5} =$ ——.

16. $4\frac{1}{5} + 6\frac{1}{2} =$ ——. 17. $8\frac{1}{2} + \frac{4}{5} =$ ——.

18. $9\frac{3}{5} - 7\frac{1}{2} =$ ——. 19. $11\frac{4}{5} - 3\frac{1}{2} =$ ——.

20. Frank shoveled $\frac{1}{2}$ the sidewalk and Henry $\frac{2}{5}$ of it. What part of the walk was shoveled? What part of the walk was not shoveled?

Written

1. $235\frac{4}{5}$	2. $307\frac{1}{2}$	3. $799\frac{1}{2}$	4. $293\frac{2}{5}$
$-187\frac{1}{2}$	$-299\frac{1}{5}$	$+609\frac{1}{5}$	$+617\frac{1}{2}$
5. $9001\frac{4}{5}$	6. $83\frac{3}{5}$	7. $428\frac{1}{2}$	8. $598\frac{4}{5}$
$-8992\frac{1}{2}$	$+79\frac{1}{2}$	$-399\frac{2}{5}$	$+2\frac{1}{2}$

1. Harry took in at his soda fountain on Monday \$6.37, on Tuesday \$9.14, on Wednesday \$6.84, on Thursday \$9.25, on Friday \$5.76, on Saturday \$7.28. *a.* How much money did he take in during the week? *b.* Harry's best day was how much better than his poorest day?

2. A merchant bought a case of pencils containing 120 boxes, each box containing 6 dozen pencils. *a.* How many dozen were there? *b.* How many pencils were there?

3. $296\frac{1}{8}$	4. $99\frac{2}{3}$	5. $793\frac{5}{9}$	6. $308\frac{4}{5}$
$+549\frac{3}{4}$	$+81\frac{1}{2}$	$-241\frac{1}{3}$	$-209\frac{1}{2}$
7. $435\frac{3}{8}$	8. $895\frac{5}{8}$	9. $973\frac{2}{3}$	10. $43\frac{5}{6}$
$+79\frac{3}{4}$	$+408\frac{1}{2}$	$+46\frac{1}{2}$	$+98\frac{2}{3}$
11. $784\frac{7}{10}$	12. $46\frac{9}{10}$	13. $89\frac{4}{5}$	14. $201\frac{7}{9}$
$+91\frac{3}{5}$	$+78\frac{1}{2}$	$+43\frac{9}{10}$	$-108\frac{2}{3}$

15. *Divide and test your work:* *a.* 17,745 by 35; *b.* 331,444 by 47; *c.* 476,834 by 95; *d.* 32,769 by 46.

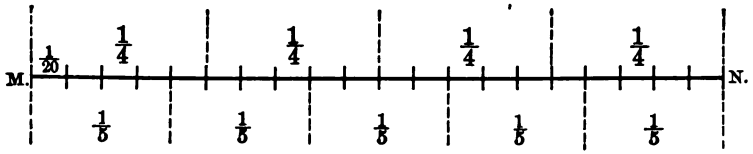
16. What number is a multiple of 436 and 987?

17. 3233 is a multiple of what number besides 53?

18. Find a number that is a multiple of 19, 23, and 41.

19. $65\frac{1}{2}-14\frac{1}{3}=?$ 20. $42\frac{2}{3}-13\frac{1}{2}=?$ 21. $84\frac{7}{8}-23\frac{3}{4}=?$

22. The ice froze $4\frac{1}{8}$ inches thick last week, and $5\frac{3}{4}$ inches more this week. *a.* How thick is it? *b.* If it should thaw $2\frac{1}{4}$ in., how thick would it then be?



1. How many are there of the smallest parts of the line MN? Each of them is what fraction of the line?

2. $\frac{1}{5}$ = how many twentieths? $\frac{1}{4}$ = how many twentieths? *To what must we change fourths and fifths in order to find their sums or differences?*

3. $4 \times 5 = ?$ $20 \div 5 = ?$ $20 \div 4 = ?$ 20 is what of 4 and 5? $\frac{2}{5} = \frac{?}{20}$; $\frac{3}{5} = \frac{?}{20}$; $\frac{4}{5} = \frac{?}{20}$; $\frac{2}{4} = \frac{?}{20}$; $\frac{3}{4} = \frac{?}{20}$.

4. $\frac{1}{4} + \frac{1}{20} = ?$ 5. $\frac{1}{5} + \frac{1}{20} = ?$ 6. $\frac{3}{4} + \frac{1}{20} = ?$ 7. $\frac{4}{5} + \frac{1}{20} = ?$

8. $\frac{1}{4} + \frac{1}{5} = ?$ 9. $\frac{2}{5} + \frac{1}{4} = ?$ 10. $\frac{1}{4} + \frac{3}{5} = ?$ 11. $\frac{4}{5} + \frac{1}{4} = ?$

12. $\frac{3}{4} + \frac{1}{5} = ?$ 13. $\frac{2}{5} + \frac{3}{4} = ?$ 14. $\frac{3}{5} + \frac{3}{4} = ?$ 15. $\frac{3}{4} + \frac{4}{5} = ?$

Written

1. $391\frac{1}{4} + 46\frac{7}{20}$

2. $493\frac{3}{4} + 81\frac{3}{20}$

3. $8711\frac{1}{20} + 46\frac{1}{5}$

4. $921\frac{1}{5} + 71\frac{1}{4}$

5. $423\frac{3}{4} + 891\frac{1}{5}$

6. $2111\frac{9}{20} - 16\frac{3}{4}$

7. $149\frac{4}{5} + \frac{3}{4}$

8. $21\frac{3}{4} - 14\frac{3}{5}$

9. $713\frac{3}{5} - 261\frac{1}{4}$

10. $3424\frac{4}{5} - 187\frac{3}{4}$

11. $613\frac{3}{5} + 88\frac{3}{4}$

12. $1234\frac{4}{5} - 383\frac{3}{4}$

13. $91\frac{7}{20} + 883\frac{3}{4}$

14. $109\frac{7}{8} - 491\frac{1}{2}$

15. $482\frac{2}{3} - 1571\frac{1}{6}$

16. $821\frac{7}{10} - 1371\frac{1}{2}$

Answer to yourself these questions about each problem: *a. What is asked? b. What is told? c. What must I find first?*

1. A liveryman bought 8 bu. of oats at $.40 a bushel and 2 loads of hay at $12 a load. What did both cost?

2. Horace traveled 37 miles and Joseph five times as far. How far did both travel? (Picture.)

3. A farmer sold some butter for $47.85, some eggs for $5.38, some hams for $11.57, and some apples for $13.50. He put $53.89 in the bank and spent the remainder of the money. How much money did he spend?

4. Mrs. Yates bought some coffee for 48 cents, some sugar for 65 cents, and some eggs for 88 cents. She gave the clerk a $5 bill. How much change should he give her?

5. A man earned $392 and used $\frac{6}{7}$ of it. *a.* How much did he use? *b.* How much had he left?

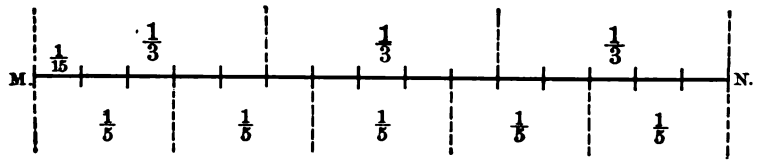
6. 8 arithmetics cost $4.48. What will 16 arithmetics cost?

7. A man earns $15 a week and saves $\frac{1}{5}$ of it. How long will it take him to save $96?

8. A man born in 1812 died in 1890. How old was he when he died?

9. Ted had 49 marbles and Ned had four times as many. How many had both?

10. Mrs. French bought 38 yards of carpet, and took back a piece 54 feet long. How many yards did she keep?



1. The line MN is divided into how many equal parts? What is each of these parts?

2. $\frac{1}{5}$ = how many fifteenths? $\frac{1}{3}$ = how many fifteenths?

3. $\frac{2}{5} = \frac{?}{15}$; $\frac{3}{5} = \frac{?}{15}$; $\frac{4}{5} = \frac{?}{15}$; $\frac{2}{3} = \frac{?}{15}$.

4. $3 \times 5 = ?$ $15 \div 3 = ?$ $15 \div 5 = ?$ 15 is what of 3 and 5?

5. *To what shall we change thirds and fifths so that we may add or subtract them?*

6. $\frac{1}{3} + \frac{1}{15} =$ ——
7. $\frac{1}{5} + \frac{1}{15} =$ ——
8. $\frac{1}{3} + \frac{1}{5} =$ ——
9. $\frac{1}{3} + \frac{2}{5} =$ ——
10. $\frac{1}{5} + \frac{2}{3} =$ ——
11. $\frac{3}{5} + \frac{1}{3} =$ ——
12. $\frac{1}{3} + \frac{4}{5} =$ ——
13. $\frac{2}{5} + \frac{2}{3} =$ ——
14. $\frac{3}{5} + \frac{2}{3} =$ ——
15. $\frac{1}{5} - \frac{1}{15} =$ ——
16. $\frac{1}{3} - \frac{2}{15} =$ ——
17. $\frac{1}{3} - \frac{1}{5} =$ ——

Written

1. $31\frac{1}{3} - 25\frac{1}{5}$
2. $49\frac{1}{3} + 82\frac{1}{5}$
3. $613\frac{2}{5} - 127\frac{1}{3}$
4. $412\frac{2}{3} - 361\frac{2}{5}$
5. $912\frac{2}{3} + 87\frac{7}{15}$
6. $17\frac{1}{3} + 21\frac{2}{5}$
7. $84\frac{3}{5} + 84\frac{1}{3}$
8. $490\frac{2}{3} - 390\frac{10}{15}$

9. Mr. Ruggles worked $4\frac{3}{5}$ months in Boston and $6\frac{2}{3}$ months in Troy. How many months did he work?

1. $\frac{1}{2}+\frac{1}{4}=?$ 2. $\frac{3}{4}+\frac{1}{8}=?$ 3. $\frac{1}{4}+\frac{3}{8}=?$ 4. $\frac{7}{8}+\frac{1}{2}=?$

5. $\frac{3}{4}+\frac{3}{8}=?$ 6. $\frac{1}{3}+\frac{1}{2}=?$ 7. $\frac{1}{2}+\frac{5}{6}=?$ 8. $\frac{1}{3}+\frac{5}{6}=?$

9. $\frac{2}{3}+\frac{1}{6}=?$ 10. $7\frac{2}{3}+\frac{1}{3}=?$ 11. $\frac{1}{3}+\frac{1}{9}=?$ 12. $\frac{1}{3}-\frac{1}{9}=?$

13. $\frac{4}{5}-\frac{7}{10}=?$ 14. $\frac{7}{10}-\frac{3}{5}=?$ 15. $\frac{5}{10}-\frac{2}{5}=?$ 16. $\frac{3}{10}-\frac{1}{5}=?$

Written

1. When 36 barrels of flour cost \$140, what will 12 barrels cost?

2. A farmer received \$240 for grain, potatoes, apples, and chickens. $\frac{1}{4}$ of the money was for potatoes, $\frac{1}{5}$ for apples, $\frac{1}{2}$ for grain, and the remainder for chickens. *a.* How much did he receive for grain? *b.* For potatoes? *c.* For apples? *d.* For chickens?

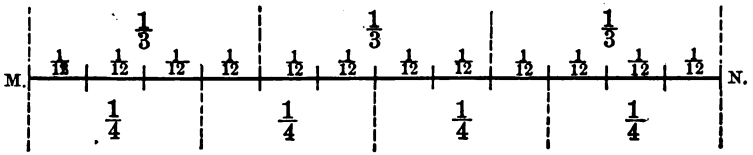
3. A trader bought a horse for \$150, and sold it so as to gain $\frac{1}{3}$ of the cost. *a.* What did he gain? *b.* For how much did he sell the horse?

4. At \$39 a head, how many head of cattle can be bought for \$4173?

5. Mr. Shepherd sold 132 sheep to one man for \$528, to another man 156 sheep for \$468, to another man 25 sheep for \$90, to another 35 sheep for \$140. *a.* How many sheep were sold? *b.* How much was received for them?

6. When \$7490 are paid for 214 cows, what is the cost of one?

7. $306\frac{5}{6}+98\frac{2}{3}$ 8. $223\frac{7}{8}-16\frac{1}{4}$ 9. $150\frac{5}{6}-139\frac{1}{3}$ 10. $17\frac{3}{5}+18\frac{2}{3}$ 11. $238\frac{7}{8}-197\frac{3}{4}$



1. $\frac{1}{3}$ of the line *MN* is how many twelfths of it?

2. $\frac{1}{4}$ of the line *MN* is how many twelfths of it?

3. Can you find how many twelfths in $\frac{1}{2}$ of the line? In $\frac{1}{6}$ of the line?

4. $\frac{2}{3}=\frac{?}{12}$; $\frac{3}{4}=\frac{?}{12}$; $\frac{5}{6}=\frac{?}{12}$; $\frac{1}{2}=\frac{?}{12}$; $\frac{1}{6}=\frac{?}{12}$.

5. *To what shall we change fourths and thirds in order to find their sums or differences?*

6. $12\div 4=?$ $12\div 3=?$ 12 is what of 4 and 3?

7. $12\div 2=?$ $12\div 6=?$ 12 is what of 6 and 2?

8. Of what four numbers is 12 a multiple?

9. $\frac{2}{3}=\frac{?}{12}$ 10. $\frac{3}{4}=\frac{?}{12}$ 11. $\frac{1}{4}+\frac{1}{12}=?$ 12. $\frac{3}{4}+\frac{1}{12}=?$

13. $\frac{1}{3}+\frac{1}{4}=?$ 14. $\frac{2}{3}+\frac{1}{4}=?$ 15. $\frac{3}{4}+\frac{1}{3}=?$ 16. $\frac{2}{3}+\frac{3}{4}=?$

17. $\frac{1}{6}+\frac{1}{12}=?$ 18. $\frac{1}{2}+\frac{1}{12}=?$ 19. $\frac{1}{12}+\frac{5}{6}=?$ 20. $\frac{5}{12}+\frac{1}{2}=?$

21. $\frac{1}{4}-\frac{1}{12}=?$ 22. $\frac{1}{3}-\frac{1}{12}=?$ 23. $\frac{1}{3}-\frac{1}{4}=?$ 24. $\frac{2}{3}-\frac{1}{4}=?$

25. $\frac{3}{4}-\frac{1}{3}=?$ 26. $\frac{3}{4}-\frac{2}{3}=?$ 27. $\frac{3}{4}-\frac{7}{12}=?$ 28. $\frac{2}{3}-\frac{5}{12}=?$

Written

1. $16\frac{1}{4}+14\frac{11}{12}$ 2. $25\frac{1}{2}+17\frac{1}{12}$ 3. $43\frac{1}{3}-16\frac{1}{12}$ 4. $84\frac{2}{3}+18\frac{3}{4}$ 5. $415\frac{7}{12}-247\frac{1}{2}$

6. $14\frac{2}{3}+93\frac{1}{4}$ 7. $67\frac{3}{4}+88\frac{1}{3}$ 8. $395\frac{3}{4}-197\frac{2}{3}$ 9. $59\frac{11}{12}-41\frac{3}{4}$ 10. $135\frac{7}{12}+296\frac{3}{4}$

1. James gave $\frac{1}{6}$ of his marbles to one boy and $\frac{1}{2}$ to another. What part of his marbles did he give away? What part did he keep?

2. If Harry ate $\frac{5}{6}$ of a melon and George $\frac{1}{2}$ of a melon, how many melons did both eat?

3. I planted $\frac{1}{3}$ of my garden to corn and $\frac{1}{4}$ to potatoes. What part of my garden is planted to corn and potatoes? Which crop occupies more of the garden and how much more?

4. $10 \times 4 = 20 \times ?$ $8 \times 3 = 4 \times ?$ $3 \times 4 = 2 \times ?$

5. If Harry has $\frac{3}{4}$ of a dollar, how much more must he obtain before he can buy a \$2 sled?

Written

1. *Add:*

a.	*b.*	*c.*	*d.*	*e.*	*f.*
$6\frac{1}{3}$	$16\frac{5}{12}$	$13\frac{1}{4}$	$4\frac{1}{4}$	$91\frac{3}{4}$	$12\frac{1}{6}$
$7\frac{1}{4}$	$15\frac{1}{2}$	$19\frac{1}{2}$	$3\frac{1}{3}$	$14\frac{2}{3}$	$3\frac{5}{12}$
$16\frac{1}{12}$	$7\frac{1}{6}$	$15\frac{1}{3}$	$2\frac{5}{12}$	$8\frac{7}{12}$	$7\frac{1}{2}$

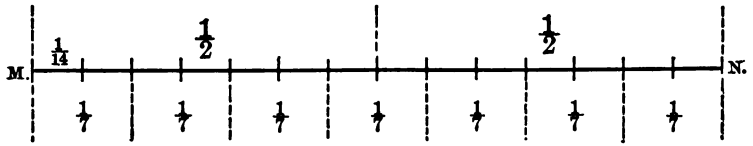
2. A garden $75\frac{3}{4}$ ft. long and $42\frac{1}{4}$ ft. wide will require how many feet of fence to inclose it? (Picture.)

3. A farm of 108 acres was sold for \$5940. What was the selling price of an acre?

4. The battleship *Kansas* is 456 feet long. *a.* How many yards long is she? *b.* How many inches?

5. 36 bushels of apples at 75 cents a bushel will exactly pay for 25 yards of cloth at —— cents a yard.

6. 10 tons of hay at \$9 a ton will pay for 18 tons of coal at \$—— per ton.



1. Into how many equal parts is the line *MN* divided? What is each of those parts called?

2. $\frac{1}{7} = \frac{?}{14}$; $\frac{1}{2} = \frac{?}{14}$; $\frac{2}{7} = \frac{?}{14}$; $\frac{3}{7} = \frac{?}{14}$; $\frac{4}{7} = \frac{?}{14}$; $\frac{5}{7} = \frac{?}{14}$; $\frac{6}{7} = \frac{?}{14}$.

3. *To what shall we change halves and sevenths to find their sums or differences?*

4. $14 \div 2 = ?$ $14 \div 7 = ?$ 14 is what of 2 and 7?

5. $\frac{1}{2} - \frac{1}{7} = ?$ $\frac{1}{2} - \frac{2}{7} = ?$ $\frac{1}{2} - \frac{3}{7} = ?$ $\frac{1}{2} + \frac{1}{7} = ?$ $\frac{1}{2} + \frac{2}{7} = ?$ $\frac{1}{2} + \frac{4}{7} = ?$

6. $\frac{1}{2} + \frac{5}{7} = ?$ $\frac{1}{2} + \frac{6}{7} = ?$ $\frac{1}{2} + \frac{1}{14} = ?$ $\frac{1}{2} + \frac{2}{14} = ?$ $\frac{1}{7} + \frac{5}{14} = ?$

7. $\frac{1}{2} + \frac{1}{7} + \frac{1}{14} = ?$ $\frac{1}{2} + \frac{2}{7} + \frac{1}{14} = ?$ $\frac{1}{2} + \frac{3}{7} + \frac{3}{14} = ?$

Written

1. *Add:*

a.	*b.*	*c.*	*d.*	*e.*
$13\frac{1}{2}$	$140\frac{1}{2}$	$23\frac{5}{14}$	$131\frac{3}{14}$	$981\frac{6}{7}$
$15\frac{1}{7}$	$139\frac{5}{7}$	$259\frac{3}{7}$	$87\frac{1}{2}$	$49\frac{1}{2}$
$28\frac{1}{14}$	64	$164\frac{1}{2}$	$63\frac{4}{7}$	$88\frac{9}{14}$

2. *Subtract:*

a.	*b.*	*c.*	*d.*	*e.*
$401\frac{1}{2}$	$71\frac{1}{2}$	$73\frac{1}{2}$	$391\frac{4}{7}$	$81\frac{5}{7}$
$359\frac{1}{7}$	$36\frac{2}{7}$	$15\frac{3}{7}$	$158\frac{1}{2}$	$29\frac{1}{2}$

3. *Add:*

a.	*b.*	*c.*	*d.*	*e.*
$13\frac{1}{2}$	$76\frac{5}{8}$	$43\frac{1}{2}$	$120\frac{11}{20}$	$12\frac{3}{7}$
$15\frac{3}{8}$	$19\frac{3}{8}$	$15\frac{2}{3}$	$96\frac{1}{5}$	$15\frac{11}{14}$
$4\frac{3}{4}$	$5\frac{3}{4}$	$7\frac{1}{6}$	$14\frac{1}{4}$	$14\frac{1}{2}$

1. Genevieve had $\frac{3}{4}$ of an orange and Edith $\frac{2}{3}$ of an orange. Which had the greater part and how much greater? (Illustrate.)

2. Four quarts of berries at 9 cents a quart will pay for how many pineapples at 12 cents apiece?

3. A page is 8 in. long and contains 40 sq. in. How wide is it? (Draw it the exact size.)

4. Which is greater, $\frac{4}{5}$ of a dollar or $\frac{3}{4}$ of a dollar? How much greater? (Show by picture.)

5. 3 five-cent packs of firecrackers and one ten-cent pack cost how much?

Written

1. *a.* If it takes $512 to pay the hands in a certain factory for one day, what will it take to pay them for one week? *b.* For 52 weeks?

2. If $\frac{1}{2}$ lb. of tea costs 22 cents, what will 5 lb. cost?

3. Take $37\frac{1}{2}$ from the sum of $15\frac{3}{4}$ and $24\frac{7}{8}$.

4. *a.* A half peck and a half bushel of peanuts are how many quarts? *b.* How much are they worth at 3 cents a pint?

5. Divide the sum of $21684\frac{3}{4}$ and $16942\frac{1}{4}$ by 19.

6. On the first day of January, Kate had $8.52 in the bank and deposited $3.15. On the first of March she drew out $4.84, and on the first of April deposited $5.86. She then had how much money in the bank?

7. How many pound cakes of sugar in 17 boxes, each containing 240 cakes?

1. Before we find the sums or differences of fourths and halves, we change the halves to ——. 4 is a —— of 2.

2. Before we find the sums or differences of fourths and eighths, we change the fourths to ——. 8 is a —— of 4.

3. Before we find the sums or differences of halves and eighths or fourths and eighths, we change the halves and fourths to ——. 8 is a —— of 2 and 4.

4. Before we find the sums or differences of halves and thirds, we change them to ——. 6 is a —— of 3 and 2.

5. Before we find the sums or differences of fifths and thirds, we change them to ——. 15 is a —— of 5 and 3.

6. Before we add halves, thirds, fourths, and sixths, we change them all to ——. 12 is a multiple of ——, ——, ——, and ——.

7. If you wish to subtract or add sevenths and thirds you change them to ——. —— is a multiple of 7 and 3. $21 \div 3 = ?$ $\frac{1}{3} = \frac{?}{21}$ $21 \div 7 = ?$ $\frac{1}{7} = \frac{?}{21}$.

8. $\frac{2}{3} = \frac{?}{21}$ $\frac{2}{7} = \frac{?}{21}$ $\frac{3}{7} = \frac{?}{21}$ $\frac{4}{7} = \frac{?}{21}$ $\frac{5}{7} = \frac{?}{21}$ $\frac{6}{7} = \frac{?}{21}$.

9. $\frac{7}{21} = \frac{?}{3}$ $\frac{14}{21} = \frac{?}{3}$ $\frac{3}{21} = \frac{?}{7}$ $\frac{6}{21} = \frac{?}{7}$ $\frac{9}{21} = \frac{?}{7}$ $\frac{12}{21} = \frac{?}{7}$.

10. $\frac{1}{3} - \frac{1}{7} = \frac{7}{21} - \frac{3}{21} = \frac{4}{21}$.

Test: $\frac{1}{7} + \frac{4}{21} = \frac{3}{21} + \frac{4}{21} = \frac{7}{21} = \frac{1}{3}$

Written

Subtract and test your work:

1. $\frac{1}{3} - \frac{2}{7}$ 2. $\frac{3}{7} - \frac{1}{3}$ 3. $\frac{2}{3} - \frac{4}{7}$ 4. $\frac{6}{7} - \frac{2}{3}$ 5. $\frac{5}{7} - \frac{1}{3}$

6. $\frac{2}{3} - \frac{3}{7}$ 7. $\frac{5}{7} - \frac{2}{3}$ 8. $\frac{2}{3} - \frac{1}{7}$ 9. $\frac{4}{7} - \frac{1}{3}$ 10. $\frac{2}{3} - \frac{2}{7}$

1. If an 8-cent tablet lasts you 4 weeks, what is the cost of your tablets for a term of 20 weeks?

2. What must be paid for a knife at 30 cents and a pair of skates at 65 cents?

3. *Change to lowest terms:* $\frac{2}{4}$; $\frac{4}{8}$; $\frac{3}{6}$; $\frac{4}{6}$; $\frac{2}{10}$; $\frac{2}{8}$; $\frac{5}{10}$; $\frac{6}{12}$; $\frac{2}{12}$; $\frac{3}{12}$; $\frac{4}{12}$; $\frac{8}{12}$; $\frac{10}{12}$; $\frac{2}{14}$; $\frac{7}{14}$; $\frac{6}{14}$; $\frac{4}{14}$; $\frac{8}{14}$; $\frac{12}{14}$.

4. Find the value of $\frac{12}{3}$; $\frac{2}{2}$; $\frac{17}{4}$; $\frac{24}{5}$; $\frac{16}{3}$; $\frac{19}{4}$; $\frac{40}{10}$; $\frac{12}{2}$.

5. What is the second multiple of 12? The third?

6. $\frac{1}{2}$ of my trees are apple trees and $\frac{1}{3}$ are cherry trees. What part of all my trees are apple and cherry?

7. What is the fourth multiple of 5? The seventh multiple of 9? The eleventh multiple of 12?

8. What is the smallest number that is a multiple of 2, 3, 4, and 5? Of 2, 4, 8, and 16? Of 3, 2, and 5?

Written

Add:

1. $42\frac{1}{7}$ $65\frac{1}{3}$	2. $83\frac{2}{3}$ $41\frac{5}{21}$	3. $29\frac{1}{3}$ $68\frac{5}{7}$	4. $49\frac{6}{7}$ $84\frac{2}{3}$	5. $196\frac{3}{7}$ $25\frac{16}{21}$
6. $421\frac{1}{3}$ $89\frac{4}{7}$	7. $93\frac{2}{7}$ $86\frac{2}{3}$	8. $57\frac{6}{7}$ $82\frac{5}{21}$	9. $18\frac{1}{2}$ $14\frac{3}{4}$ $5\frac{7}{8}$	10. $6\frac{1}{3}$ $4\frac{1}{2}$ $7\frac{5}{6}$
11. $48\frac{1}{2}$ $13\frac{3}{4}$ $5\frac{2}{3}$	12. $16\frac{1}{6}$ $12\frac{2}{3}$ $14\frac{1}{2}$	13. $85\frac{1}{3}$ $16\frac{1}{4}$ $12\frac{1}{6}$	14. $31\frac{1}{2}$ $53\frac{2}{3}$ $67\frac{3}{4}$	15. $9\frac{1}{8}$ $10\frac{3}{4}$ $12\frac{1}{2}$

16. The rent of a store is \$840 a year. How much rent must be paid for the store for $3\frac{1}{4}$ years?

1. Name a number which is a multiple of 8 and 3.

2. If we wish to add or subtract eighths and thirds, to what shall we change them?

3. Name all the numbers of which 24 is a multiple. What fractions other than eighths and thirds can you add or subtract by changing them to 24ths?

4. $\frac{1}{8}=\frac{?}{24}$ $\frac{1}{3}=\frac{?}{24}$ $\frac{1}{4}=\frac{?}{24}$ $\frac{1}{6}=\frac{?}{24}$ $\frac{1}{12}=\frac{?}{24}$.

5. $\frac{1}{2}=\frac{?}{24}$ $\frac{3}{8}=\frac{?}{24}$ $\frac{2}{3}=\frac{?}{24}$ $\frac{3}{4}=\frac{?}{24}$ $\frac{5}{6}=\frac{?}{24}$ $\frac{5}{12}=\frac{?}{24}$.

6. $\frac{5}{8}=\frac{?}{24}$ $\frac{7}{12}=\frac{?}{24}$ $\frac{11}{12}=\frac{?}{24}$ $\frac{1}{3}+\frac{1}{8}=?$ $\frac{1}{8}-\frac{1}{12}=?$

7. $\frac{1}{8}+\frac{1}{6}=?$ $\frac{1}{6}-\frac{1}{8}=?$ $\frac{1}{3}+\frac{5}{24}=?$ $\frac{1}{2}-\frac{1}{24}=?$ $\frac{1}{8}+\frac{7}{24}=?$

Written

1. $35\frac{1}{3}$ $+42\frac{1}{8}$	2. $81\frac{1}{3}$ $-37\frac{1}{8}$	3. $24\frac{1}{4}$ $+99\frac{1}{6}$	4. $52\frac{1}{8}$ $+49\frac{5}{6}$	5. $29\frac{3}{8}$ $-16\frac{1}{12}$
6. $48\frac{7}{12}$ $-29\frac{3}{8}$	7. $405\frac{11}{12}$ $-98\frac{5}{8}$	8. $48\frac{7}{8}$ $+91\frac{2}{3}$	9. $479\frac{7}{8}$ $-379\frac{2}{3}$	10. $405\frac{5}{6}$ $-399\frac{5}{8}$
11. $43\frac{7}{12}$ $+89\frac{5}{24}$	12. $72\frac{2}{3}$ $-16\frac{5}{8}$	13. $35\frac{5}{8}$ $+88\frac{2}{3}$	14. $213\frac{7}{8}$ $-164\frac{2}{3}$	15. $315\frac{5}{6}$ $-143\frac{1}{4}$
16. $43\frac{5}{24}$ $64\frac{4}{24}$ $13\frac{7}{24}$ $18\frac{1}{24}$	17. $16\frac{11}{24}$ $19\frac{7}{24}$ $22\frac{9}{24}$ $31\frac{5}{24}$	18. $99\frac{3}{8}$ $63\frac{5}{24}$ $71\frac{1}{4}$ $81\frac{1}{12}$	19. $71\frac{5}{8}$ $99\frac{3}{8}$ $16\frac{2}{3}$ $14\frac{1}{6}$	20. $63\frac{5}{16}$ $47\frac{7}{16}$ $31\frac{11}{16}$ $2\frac{1}{8}$

21. $3\frac{1}{2}+4\frac{2}{3}+5\frac{1}{4}=?$ 22. $6\frac{2}{5}+3\frac{3}{10}+14\frac{3}{20}=?$

23. $3\frac{1}{2}+3\frac{5}{6}+6\frac{5}{24}=?$

1. From the sum of $4\frac{3}{5}$ and $6\frac{1}{4}$ take the sum of $2\frac{1}{2}$ and $3\frac{1}{4}$.

2. Ben rode his wheel $5\frac{2}{3}$ miles on Monday and $6\frac{3}{5}$ miles on Tuesday. How many miles did he ride in the two days?

3. One bale of hay weighs $175\frac{1}{4}$ lb., another, $186\frac{5}{8}$ lb., and another $199\frac{1}{2}$ lb. How many pounds do all three weigh?

4. A collector received $\$2\frac{3}{4}$ at one house, $\$5\frac{7}{8}$ at another, $\$6\frac{1}{2}$ at another, and $\$8\frac{1}{2}$ at another. How much did he receive?

5. Change to lowest terms $\frac{18}{20}$; $\frac{20}{24}$; $\frac{12}{18}$; $\frac{9}{27}$; $\frac{12}{15}$; $\frac{12}{16}$.

6. Find the value of $\frac{298}{7}$; $\frac{4632}{11}$; $\frac{8972}{12}$; $\frac{1728}{24}$.

7. *a.* Find the cost of 35 bushels of potatoes at 58 cents a bushel.

b. Find the cost of 19 bushels of apples at 87 cents a bushel.

c. Find the cost of 15 boxes of peaches at 35 cents a box.

d. Find the cost of all three of the above items.

8. Eugene ran $26\frac{11}{12}$ rods while Charles ran $25\frac{1}{2}$ rods. Which was ahead and how much, if they started together?

9. *a.* How many pounds of cotton in 100 bales, each weighing 480 lb.? *b.* How many tons?

10. 1000 lb. is what part of a ton? At $\$18$ a ton what is the cost of 1000 lb. of hay?

1. To what would you change ninths and halves if you wished to add or subtract them?

2. What other fractions than ninths and halves could be added or subtracted by making the same change?

3. What is the smallest number that exactly contains 2, 3, 6, and 9?

4. $\frac{1}{2}=\frac{?}{18}$, $\frac{1}{3}=\frac{?}{18}$, $\frac{1}{6}=\frac{?}{18}$, $\frac{1}{9}=\frac{?}{18}$, $\frac{2}{3}=\frac{?}{18}$, $\frac{2}{9}=\frac{?}{18}$, $\frac{5}{6}=\frac{?}{18}$.

5. $\frac{4}{9}=\frac{?}{18}$, $\frac{5}{9}=\frac{?}{18}$, $\frac{7}{9}=\frac{?}{18}$, $\frac{8}{9}=\frac{?}{18}$.

6. $\frac{1}{3}+\frac{1}{18}=?$ $\frac{1}{2}+\frac{5}{18}=?$ $\frac{1}{6}+\frac{11}{18}=?$ $\frac{1}{9}+\frac{15}{18}=?$

7. $\frac{1}{2}+\frac{1}{9}=?$ $\frac{1}{2}-\frac{1}{9}=?$ $\frac{1}{2}+\frac{4}{9}=?$ $\frac{1}{6}+\frac{2}{9}=?$ $\frac{1}{9}+\frac{5}{6}=?$

8. $\frac{5}{9}-\frac{1}{2}=?$ $\frac{7}{9}+\frac{1}{2}=?$ $\frac{8}{9}-\frac{1}{2}=?$ $\frac{3}{9}+\frac{5}{6}=?$

Written

1. $39\frac{1}{3}$ $+42\frac{7}{18}$	2. $316\frac{5}{9}$ $-215\frac{1}{2}$	3. $45\frac{1}{2}$ $-27\frac{2}{9}$	4. $38\frac{4}{9}$ $+98\frac{1}{2}$	5. $486\frac{5}{18}$ $+397\frac{1}{2}$
6. $32\frac{11}{18}$ $-23\frac{4}{9}$	7. $99\frac{1}{6}$ $+99\frac{1}{9}$	8. $304\frac{7}{9}$ $-108\frac{1}{2}$	9. $392\frac{2}{3}$ $-186\frac{7}{18}$	10. $83\frac{1}{2}$ $-47\frac{2}{9}$
11. $203\frac{5}{9}$ $-107\frac{1}{6}$	12. $84\frac{5}{6}$ $+17\frac{1}{9}$	13. $45\frac{1}{2}$ $-13\frac{1}{4}$	14. $79\frac{2}{3}$ $-16\frac{2}{9}$	15. $239\frac{1}{2}$ $-175\frac{3}{8}$
16. $43\frac{7}{18}$ $56\frac{11}{18}$ $23\frac{5}{18}$	17. $39\frac{1}{9}$ $25\frac{1}{6}$ $41\frac{1}{2}$	18. $99\frac{1}{9}$ $25\frac{1}{6}$ $42\frac{1}{3}$	19. $43\frac{1}{3}$ $51\frac{1}{9}$ $17\frac{1}{2}$	20. $8\frac{7}{18}$ $2\frac{1}{3}$ $6\frac{5}{9}$

21. $11\frac{2}{9}+6\frac{1}{3}+7\frac{1}{6}+3\frac{5}{18}=?$

22. $4\frac{5}{6}+1\frac{1}{9}+2\frac{1}{18}+3\frac{1}{3}=?$

23. $5\frac{1}{9}+2\frac{1}{6}+8\frac{1}{2}+4\frac{1}{3}=?$

24. $3\frac{1}{6}+4\frac{1}{8}+5\frac{1}{3}+2\frac{1}{4}=?$

1. $\frac{1}{2}$ pk. + $\frac{1}{8}$ pk. is how many quarts?

2. Which is greater, $\frac{2}{3}$ of a foot or $\frac{3}{4}$ of a foot, and how much greater?

3. Which is greater and how much, $\frac{3}{5}$ of a day or $\frac{2}{3}$ of a day?

4. A milk man sold a customer 5 quart tickets and 8 pint tickets. How many quarts of milk must he give for all the tickets? How much is it worth at seven cents a quart?

5. When 2 lb. of sugar are sold for 9 cents, what must be paid for 8 lb.? 8 lb. is how many times 2 lb.?

Written

1. A young man earns $575 a year. What has he left after paying his board at $15 a month?

2. $8820 was divided equally among 84 Indians. How much money did each receive?

3. 18 boys received each 38 cents for distributing hand-bills on Saturday. How much did they all receive?

4. Multiply the difference between 6008 and 2119 by 69.

5. John earned $2\frac{1}{2}$, William $1\frac{3}{4}$, and Henry $5\frac{3}{5}$. How much did all earn?

6. A boy ate $\frac{1}{2}$ of a cocoanut. What part of the cocoanut was left if he had $\frac{7}{9}$ of it at first?

7. The four sides of a field are $33\frac{1}{2}$ rods, $16\frac{3}{4}$ rods, $38\frac{5}{8}$ rods, and 41 rods. How many rods of fence will inclose the field?

1. Here are how many pies? Take away 2 pies. How many are left? If you take away $2\frac{1}{2}$ pies, what must you do to one of the pies? Make a picture of the $2\frac{1}{2}$ pies that you take away. Make a picture of the pies that are left. 5 pies less $3\frac{1}{2}$ pies are how many pies? 5 apples less $3\frac{1}{2}$ apples = ?

2. Make a picture of 5 pies less $1\frac{1}{2}$ pies; 5 pies less $1\frac{3}{4}$ pies; 9 pies less $3\frac{1}{3}$ pies; 4 pies less $1\frac{1}{8}$ pies; 5 pies less $2\frac{3}{8}$ pies.

3. From 5 take $2\frac{7}{9}$. $5 = 4\frac{9}{9}$

$2\frac{7}{9} = 2\frac{7}{9}$

$2\frac{2}{9}$ *Remainder.*

4. $83 - 17\frac{1}{2}$	5. $48 - 19\frac{1}{4}$	6. $631 - 29\frac{3}{4}$	7. $7 - 2\frac{3}{8}$	8. $431 - 231\frac{1}{5}$
9. $423 - 192\frac{1}{3}$	10. $69 - 58\frac{5}{6}$	11. $29 - 9\frac{3}{7}$	12. $401 - 300\frac{2}{3}$	13. $43 - 18\frac{3}{5}$
14. $61 - \frac{4}{18}$	15. $46 - 1\frac{5}{8}$	16. $28 - 14\frac{7}{10}$	17. $13 - 4\frac{5}{11}$	18. $16 - 15\frac{19}{20}$
19. $1 - \frac{17}{21}$	20. $61 - 15\frac{3}{7}$	21. $832 - 731\frac{23}{24}$	22. $39 - 8\frac{7}{9}$	23. $487 - 486\frac{9}{13}$

1. How many pounds in 5 tons of coal?

2. A man bought a wheelbarrow for $3.75 and paid for it with a $5 bill. What change should he receive?

3. Minnie had 5 apples and gave $1\frac{3}{4}$ apples to her sister. How many had she left?

4. $15\frac{1}{3}$ barrels of water were drawn out of a cistern containing $19\frac{1}{2}$ barrels. How many barrels were left?

5. A boy was four feet tall on his ninth birthday. He had grown $1\frac{3}{4}$ inches in a year. How many inches tall was he on his eighth birthday?

Written

1. Write in words 410,004; 203,416; 3,000,015.

2. Express in figures seven hundred six thousand twenty-nine.

3. Write in Roman, 451. Write in figures, CCXI.

4. Add $10.06, $15.72, $60.87, $1.59, $3.45.

Add:

5.	6.	7.	8.	9.	10.	11.
63	87	42	96	54	83	28
59	64	35	42	96	73	18
17	65	49	28	16	94	31
64	82	39	50	26	45	17
23	72	18	25	16	25	29
36	28	65	32	44	46	38

Multiply:

12.	13.	14.	15.	16.	17.
896	897	598	384	999	894
94	63	76	65	106	200

We have learned that —— cents make one dime and that —— dimes make one dollar.

The smallest piece of money used in our country is the cent, but in making calculations we sometimes have to speak of smaller amounts than one cent.

One tenth of a cent is called a **mill**; $\frac{3}{10}$ of a cent are three mills; $\frac{7}{10}$ of a cent are seven mills, etc. $\frac{5}{10}$ of a cent are how many mills? What part of a cent are 9 mills? Since a mill is $\frac{1}{10}$ of a cent, —— mills make one cent.

A ten-dollar gold piece is called an eagle.

TABLE OF UNITED STATES MONEY

—— **mills make 1** ——.
—— **cents make 1** ——.
—— **dimes make 1** ——.
—— **dollars make 1** ——.

1. A 5-cent piece is what part of a dime?
2. A dime is what part of a dollar?
3. A 50-cent piece is how many dimes?
4. A 25-cent piece is how many dimes?
5. How many 25-cent pieces are worth as much as a silver dollar?
6. Express $\$2\frac{1}{4}$ as dollars and cents.
7. Express $4\frac{1}{2}$ dimes as cents.
8. A half dime, 2 dimes, a quarter, and a 50-cent piece are how many cents? How many dollars?

1. A dairyman sold 459 lb. of cheese at $.11 per pound. How much did he receive for it?

459
$.11
$50.49

He received as many cents as the product of 459 and 11, or 5049 cents, which equals $50.49. *Answer.*

2. 1423 bu. of peaches at $1.25 per bushel cost how much?

1423
$1.25
7115
2846
1423
$1778.75

$1.25 = 125 cents. 1423 bu. of peaches at 125 cents a bushel cost as many cents as the product of 1423 and 125, or 177875 cents, which equals $1778.75. *Answer.*

3. What must be paid for 7 dozen handkerchiefs at $1.85 per dozen?

$1.85
7
$12.95

At $1.85 per dozen, 7 dozen handkerchiefs will cost as many cents as the product of 185 and 7, or 1295 cents, which equals $12.95. *Answer.*

NOTE. — From the above examples, it is seen that when either the multiplicand or multiplier contains cents, the product also contains cents. We may use either factor for the multiplier, pointing off two places, for cents, in the product.

4. A man bought a bushel of berries for $2.88 and sold them for $3.15. At that rate, how much would he gain on 123 bushels?

5. Find the cost of 19 lb. of coffee at $.33 a pound and 134 lb. of tea at $.56 per pound.

Make problems and multiply:

6.	7.	8.	9.	10.
$4.15	247	$9.36	3456	438
39	$.05	42	$.98	$.25

1. *Find the sums and time yourself:*

a.	*b.*	*c.*	*d.*
$41.36	$34.63	$12.98	$46.89
52.81	8.47	6.32	4.37
8.46	92.45	4.28	90.19
79.38	3.06	7.91	7.81
8.92	93.57	5.16	6.29
4.05	.69	70.80	4.38

2. *Find what I must pay for all of these articles:*

5 boxes of note paper at	$.25 per box.
5 dozen tablets at	.50 per dozen.
12 paper weights at	.19 apiece.
7 ink wells at	.29 apiece.
3 bottles of mucilage at	.05 per bottle.
1 pair of scissors at	.62 per pair.

3. A merchant bought 56 yd. of silk for $43.68. *a.* What did one yard cost? *b.* What did 11 yd. cost?

4. A farmer bought 12 sheep at $3.75 apiece. If he sold them at $4.75 apiece, what was his entire gain?

5. Mr. Taylor went to Boston. His railroad fare was $8.22 each way. He paid a hotel bill of $3.50 per day for 6 days. His other expenses were $7. If he started with $50, how much had he left?

6. A man worked a week for $2.75 per day. How much more did he earn than enough to buy a coat for $9.75, a vest for $1.90, and a hat for $2.00?

7. From the sum of $4.75 and $3.74 take the sum of $2.38 and $4.25.

1. Frank's mother made 4 pies. They were cut into quarters, and to each of seven boys was given a quarter. How many pies were left? (Picture.)

2. Susan found 7 apples under the pippin tree. After she had given away 4 apples, and eaten $\frac{3}{8}$ of an apple, how many were left?

3. What is the 7th multiple of 12? 56 is the 8th multiple of what? 150 is the 10th multiple of what?

4. Give three factors of 20; four factors of 16.

5. Name three numbers that will exactly divide 28.

6. Name three numbers that will exactly contain 5.

Written

1. From the sum of \$12.15 and \$16.48 subtract the sum of \$10.18 and \$9.50.

2. Add six hundred four thousand five hundred eight to ninety-four thousand fifty-six, and from the sum subtract five hundred six thousand ten.

3. A farmer had 25 acres of corn which yielded 55 bushels per acre. *a.* How many bushels of corn did the farmer have? *b.* How many pounds did it weigh if a bushel weighed 56 pounds?

4. *a.* Find the cost of 5 chickens at 37 cents apiece and 8 ducks at 42 cents each.

b. How much more do the ducks cost than the chickens?

5. *a.* $6\frac{5}{6}+4\frac{5}{8}+7\frac{3}{4}=?$ *b.* $9\frac{11}{12}-7\frac{3}{4}=?$ (Problems.)

6. Express in Roman 696; in figures DCXCIV.

One fourth of a pint is a **gill.** It is sometimes used in measuring small quantities of liquids. A common teacup holds a little less than two gills.

TABLE OF LIQUID MEASURE

—— **gills (gi.) make 1** ——
—— **pints (pt.) make 1** ——
—— **quarts (qt.) make 1** —— **(gal.)**

1. There are how many pints in a gallon?
2. There are how many gills in a gallon?
3. Three quarts are what part of a gallon?
4. Seven pints are what part of a gallon?
5. Five gills are what part of a gallon?

Written

1. A milkman sold 19 gal. of cream in bottles, each holding 2 gi. How many bottles of cream did he sell?

2. One customer bought 2 gal. 1 qt. of milk, another 7 qt., and another 20 pint bottles. How many quarts of milk did they all buy?

3. How many gallons and quarts of vinegar are needed for 138 cans of pickles, using 1 pt. of vinegar for each can?

4. Change to pints: *a.* 17 gal. 3 qt. *b.* 51 gal. 1 pt. *c.* 144 gi. *d.* 4325 gal.

5. Change to gallons: *a.* 128 qt. *b.* 112 pt. *c.* 352 gi.

6. How many days will 5 gal. of oil last an engineer who uses 1 gi. every day?

1. When a gallon of molasses is worth 48 cents, what is a pint worth? Two quarts? One gill?

2. At 24¢ a dozen what must be paid for 18 eggs?

3. If 6 plums cost a cent, how many can be bought for 12 cents?

4. $3\frac{1}{2}$ lb. of beefsteak cost how much at \$.12 per lb.?

5. How many dollars must be paid for 15 spelling books at $\$\frac{1}{4}$ apiece?

6. What is the smallest number that contains the factors 3, 2, and 5? 2, 3, and 4? 5, 4, 10, and 2?

Written

1. A merchant sold $3\frac{1}{4}$ yd. of velvet to one lady, $4\frac{7}{8}$ yd. to another, $1\frac{1}{2}$ yd. to another, and $1\frac{9}{16}$ yd. to another. How many yards of velvet did he sell to all?

2. Irene bought a handkerchief for $\$\frac{3}{8}$, bead trimming for $\$\frac{3}{4}$, and a sailor hat for \$1. *a.* What was the entire cost? *b.* What change did she receive for a \$5 bill?

3. $\frac{3978}{39} = ?$ $\frac{11704}{56} = ?$ $\frac{8932}{29} = ?$ $\frac{14847}{49} = ?$ $\frac{24644}{61} = ?$

4. *Add:*

a.	*b.*	*c.*	*d.*	*e.*
$2\frac{1}{2}$	$3\frac{1}{3}$	$92\frac{3}{4}$	$46\frac{1}{5}$	$48\frac{1}{9}$
$\frac{3}{8}$	$2\frac{5}{6}$	$42\frac{1}{2}$	$79\frac{9}{10}$	$32\frac{5}{9}$
$5\frac{3}{4}$	$7\frac{1}{6}$	$79\frac{5}{8}$	$48\frac{3}{10}$	$66\frac{13}{18}$
$2\frac{7}{8}$	$8\frac{1}{2}$	$64\frac{7}{8}$	$80\frac{4}{5}$	$99\frac{1}{2}$

5. *Subtract and test your work:*

a.	*b.*	*c.*	*d.*	*e.*
39	$40\frac{1}{3}$	$98\frac{3}{4}$	$78\frac{4}{7}$	$435\frac{1}{3}$
$19\frac{3}{7}$	$36\frac{1}{5}$	$21\frac{3}{5}$	$29\frac{1}{3}$	$241\frac{1}{8}$

TABLE OF DRY MEASURE

—— pints (pt.) make 1 ——
—— quarts (qt.) make 1 ——
—— pecks (pk.) make 1 —— (bu.)

NOTE. — One quart, dry measure, is nearly equal to 1¼ quarts, liquid measure.

1. 1 bu. = —— pk. = —— qt. = —— pt.
2. How many quarts in 1 bu.? In ½ bu.? In ⅛ bu.?
3. Seed corn at 2 cents a pint is how much a quart?
4. 3 quarts are what part of a peck?
5. A man bought a bushel of beans, sold 3 pk., and gave away 4 qt. How many pints did he keep?

Written

1. A boy bought 3 bu. of peanuts at $1.75 per bushel. *a.* What did they cost? *b.* He roasted them and sold them at the rate of 5 cents for a pint cupful. What did he receive? *c.* How much did he gain?
2. *a.* In 205 bushels there are how many pecks? *b.* How many quarts? *c.* How many pints?
3. In 435 pt. there are: *a.* How many quarts and pints? *b.* How many pecks, quarts, and pints? *c.* How many bushels, pecks, quarts, and pints?
4. ½ bu. and ¼ bu. are how many pints?
5. If 8 bu. of sweet potatoes cost $6.72, what will 1 peck cost at the same rate?
6. If my horse eats 6 quarts of oats a day, how many days will 12 bushels of oats last him?

1. An orchard has 600 trees in 20 rows. How many trees in a row?

2. To how many girls could 6 apples be given if each girl receives $\frac{1}{3}$ of an apple? (Illustrate.)

3. $40+30=?$ $43+34=?$ $35+27=?$ $24+29=?$

4. $93-33=?$ $93-37=?$ $42-26=?$ $84-45=?$

5. $\frac{1}{4}$ and $\frac{1}{3}$ of a pound of sugar are what part of a pound?

6. If there are ten brown eggs in 9 dozen and the rest are white, how many are white?

7. One eleventh of a class of 55 pupils are absent. How many are present?

Written

1. A man received \$2.40 for eight hours' work. How much did he receive for three hours' work?

2. 800 qt. are how many bushels?

3. Where are the hour and minute hands of a clock at half past 12? (Picture.)

4. Express in Roman three hundred fifty-four.

5. How many quart boxes can be filled from 38 bushels of peaches?

Add:

6. $3\frac{2}{3}$, $5\frac{1}{8}$, $7\frac{1}{2}$, $4\frac{5}{24}$

7. $4\frac{5}{8}$, $11\frac{3}{4}$, $5\frac{1}{2}$, $8\frac{3}{16}$

8. $4\frac{2}{3}$, $6\frac{1}{2}$, $5\frac{5}{6}$, $8\frac{3}{8}$

9. $8\frac{3}{5}$, $7\frac{7}{10}$, $5\frac{1}{2}$, $3\frac{3}{4}$

10. $2\frac{4}{15}$, $5\frac{2}{3}$, $6\frac{4}{5}$, $8\frac{2}{3}$

TABLE OF TIME

—— **seconds (sec.) make 1** ——
—— **minutes (min.) make 1** ——
—— **hours (hr.) make 1** ——
—— **days (da.) make 1** —— **(wk.)**
—— **months (mo.) make 1** —— **(yr.)**

Learn:

"Thirty days have September,
April, June, and November."

1. How many months have 30 days each?

2. February has 28 days in all years but leap years. How often does leap year come?

3. How many days has February in leap year?

4. How many months have 31 days each?

5. *a.* Write the names of the months in order with the number of days in each. *b.* Which long months are not separated by short months?

6. How many seconds in 1 hour?

7. How many minutes in $1\frac{1}{2}$ hr.?

8. 15 min. is what part of an hour? 30 min.? 45 min.?

9. There are 180 minutes in a certain number of hours. 180 is the product of 60 and ——.

10. 2 hours is what part of a day? 3 hr.? 8 hr.? 12 hr.?

11. How many hours in $\frac{2}{3}$ of a day? In $\frac{3}{4}$ of a day? In $\frac{5}{6}$ of a day? In $\frac{3}{8}$ of a day? In $\frac{7}{8}$ of a day?

12. Twelve boys went to a fire and were 15 min. late at school. How many minutes were lost? How many hours?

1. In the month of September there are how many (*a*) hours, (*b*) minutes, (*c*) seconds?

2. *a.* If a clock pendulum swings once every second, in how many minutes will it swing 1,814,400 times? *b.* In how many hours? *c.* In how many days? *d.* In how many weeks?

3. The Spanish War was fought in 1898. That was how many years ago?

4. In four years, February has how many days less than January has during the same years? Hours? Minutes?

5. If you are idle one fourth of the time during eight hours of every day, how many hours do you lose during a year of 307 working days?

6. $1296 a year is how many dollars a month?

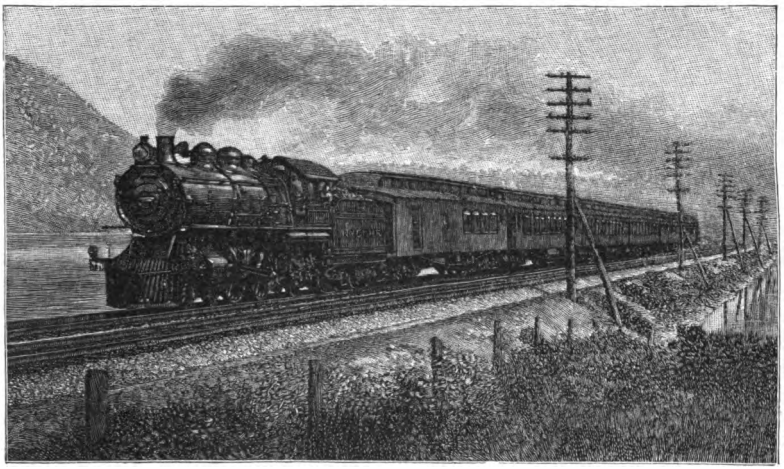
7. If there are 300 working days in a year, how much would it cost to hire a man for 5 years at $3\frac{1}{2}$ per day?

8. The President of the United States receives a salary of $50,000 per year. If his expenses are $35,000 per year, how much a month can he save from his salary?

9. If a boy sells an average of 1 paper a minute for half an hour every day, at 2 cents apiece, how much money will he take in during a week?

10. From noon until midnight is how many minutes?

11. March, April, and May are the spring months. September, October, and November are the fall months. Which is longer, spring or fall, and how much?



From photograph by A. P. Yates.

1. This train is called the "20th Century Limited." It runs from New York to Chicago, a distance of 980 miles, in 18 hours. *a.* That is an average rate of how many miles an hour? *b.* What part of a day is required for the trip? *c.* How many minutes are required for the trip? *d.* If the five cars are each 73 feet long and the locomotive and tender together are 58 ft. long, how long is the train?

2. When this picture was taken, the train was running at the rate of 90 miles an hour. *a.* It was running at what rate per minute? *b.* How far would it go in 20 min. at that rate?

3. *a.* Find the cost of a ticket from New York to Chicago at 2¢ per mile. *b.* From New York to Buffalo is 440 miles. From Buffalo to Chicago is how far?

1. Divide 4693 by 100.

$46\frac{93}{100}$ *Quotient* $4693 = 4600 + 93$

$100\overline{)4693}$ $4600 \div 100 = 46$

$93 \div 100 = \frac{93}{100}$ $46\frac{93}{100}$ *Quotient*

2. Divide 3687 by 40.

$92\frac{7}{40}$ *Quotient* $3687 = 3680 + 7$

$40\overline{)3687}$ $3580 \div 40 = 92$

$7 \div 40 = \frac{7}{40}$ $92\frac{7}{40}$ *Quotient*

3. Divide 54,763 by 500.

$109\frac{263}{500}$ *Quotient* $54{,}763 = 54{,}700 + 63$

$500\overline{)54763}$ $54{,}700 \div 500 = 109$ and 200 over

$263 \div 500 = \frac{263}{500}$ $109\frac{263}{500}$ *Quotient*

4. $149 \div 10$

5. $3462 \div 10$

6. $84{,}763 \div 1000$

7. $5638 \div 1000$

8. $2420 \div 20$

9. $3742 \div 200$

10. $9747 \div 50$

11. $98{,}924 \div 40$

12. $6807 \div 340$

13. $947{,}612 \div 3000$

14. $29{,}305 \div 600$

15. $6350 \div 50$

16. $98{,}370 \div 90$

17. $73{,}462 \div 90$

18. $742{,}491 \div 6000$

19. $\frac{14030}{46}$

20. $\frac{17464}{74}$

21. $\frac{79808}{58}$

22. $\frac{162400}{35}$

23. In examples 19 to 22, tell which numbers are products and which are factors. When a product and one of its two factors are given, how can the other factor be found? $70{,}196 = 92 \times ?$

24. A rifle range is 625 yards long and 98 yards wide. How many square yards does it contain? The area is what of 98 and 625? Find the perimeter.

TABLE OF AVOIRDUPOIS WEIGHT

—— **ounces (oz.) make 1 pound**
—— **pounds (lb.) make 1 ton (T.)**

1. Give the number of ounces in $\frac{1}{2}$ lb.; $\frac{3}{4}$ lb.; $\frac{5}{8}$ lb.

2. How many ounces in 1 T.?

3. How many pounds in $\frac{1}{2}$ T.? In $\frac{1}{4}$ T.?

4. 100 pounds is what part of a ton?

5. 100 pounds is sometimes called a **hundredweight.** *Cwt.* stands for hundredweight. How many hundredweight make a ton? $\frac{1}{2}$ T.? $\frac{1}{4}$ T.? $\frac{3}{4}$ T.?

6. What must be paid for 1 T. of hay at \$1 per hundredweight?

7. If a ton of coal cost \$4.00, what will 5 cwt. cost?

8. At \$2 per hundredweight, what will 1 T. cost?

Written

1. How many 4-ounce bags can I fill from a box containing $7\frac{1}{2}$ lb. of candy?

2. I had 12 T. of coal delivered in bags holding 100 lb. apiece. How many bags of coal were there?

3. A wagon contained a ton of coal. $\frac{3}{5}$ of it was delivered to Mr. A. and 450 lb. to Mr. B. *a.* How many pounds did Mr. A. receive? *b.* How many pounds remained in the wagon?

4. If there are 80 pieces of baggage in the baggage car (p. 185), weighing an average of 50 lb. apiece, how many tons does the baggage weigh?

THE TABLE OF LINEAR MEASURE

12 inches (in.) make 1 foot.
3 feet (ft.) make 1 yard.
$5\frac{1}{2}$ yards (yd.) or $16\frac{1}{2}$ feet make 1 rod.
320 rods (rd.) make 1 mile (mi.).

Oral

1. The longest boards commonly used for floors, siding, etc., are 16 feet long. They are how much less than a rod long? They are how many yards and feet long?

2. Measure a rod on the floor with a foot rule, and then with a yardstick. Draw on the blackboard a line that you think is 1 rod long. Measure and correct it. Estimate and measure various distances, as the length and breadth of the school lot, the distance to the nearest corner, etc.

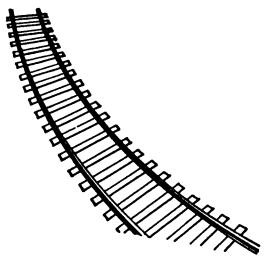
3. A city lot 3 rods wide is how many feet wide? A city lot 4 rods wide is how many feet wide?

4. A city lot 8 rods long is how many feet long?

5. Knowing that $5\frac{1}{2}$ yd. make 1 rod, how could you prove that $16\frac{1}{2}$ feet make one rod?

6. A short city block is about 20 rd. long. How many such blocks would make a mile? If the blocks were twice as long, how many blocks would make a walk of 1 mile?

7. How many feet of moulding will make a picture frame 36 in. by 24 in? Make a drawing.



1. Find the number of feet in one mile.

2. How many ties are needed for a mile of railroad track, if they are laid two feet apart, from center to center?

3. If a man's steps are each three feet long, how many steps will he take in walking $1\frac{1}{2}$ miles?

4. A field is in the shape of a rectangle 44 rods by 68 rods. How many rods of fence are needed to inclose it? (Picture.)

5. *a*. How many feet in $\frac{1}{2}$ mi.? *b*. In $\frac{1}{4}$ mi.? *c*. In $\frac{1}{3}$ mi.? *d*. In $\frac{1}{6}$ mi.? *e*. In $\frac{1}{8}$ mi.? *f*. In $\frac{7}{8}$ mi.? *g*. In $\frac{5}{6}$ mi.? *h*. In $\frac{2}{3}$ mi.? *i*. In $6\frac{3}{4}$ mi.?

6. A 16-foot wire could be cut into how many 1-inch pieces?

7. How many yards of matting would be needed to reach the length of a hall that is 87 ft. long?

8. A man bought a rope 66 ft. long. He cut off and used $\frac{1}{3}$ of it? How many inches of rope were left?

9. A race track, shaped like a zero, is 80 rods around. *a*. How many times must a runner go around the track to run 2 miles? *b*. How many miles does he run in going around the track 32 times?

10. How many yards make a mile?

11. How many inches in a mile?

12. How many inches in $\frac{5}{8}$ of a mile?

1. What is the cost of 42 yd. of carpet at \$.75 a yard?

2. A peach orchard contains 625 trees in 25 equal rows.

a. How many trees in each row?

b. If each tree bears 168 peaches, how many peaches do all the trees bear?

c. How many baskets, each holding 28 peaches, will contain the crop?

d. If they are shipped in crates, each holding 6 baskets, how many crates are needed?

e. What are the peaches worth at 95 cents a crate?

3. Mr. Blank earns \$96 a month and his expenses are \$58 a month. *a.* How much can he save in 1 year? *b.* How much can he save in 25 years?

4. How many hundredweight of coal in 25 tons?

5. John was born in 1888 and Ethel in 1897. *a.* How old is each now? *b.* John is how much older than Ethel?

6. If a clock gains 2 min. every day, in how many days will it gain $1\frac{1}{2}$ hours?

7. How many hundredweight in 27 tons?

8. *a.* How many feet in 48 rods? *b.* How many yards?

9. $\frac{1}{9}+\frac{1}{2}+\frac{5}{6}+\frac{2}{3}=?$

10. $\frac{3}{4}+\frac{5}{6}+\frac{7}{8}+\frac{2}{3}=?$

11. $\frac{1}{2}+\frac{3}{5}+\frac{7}{10}+\frac{11}{20}=?$

12. $\frac{17}{20}-\frac{3}{5}=?$

13. $136-19\frac{4}{5}=?$

14. $\frac{2}{3}-\frac{5}{8}=?$

15. $\frac{803+796}{39}=?$

16. $\frac{647-256}{23}=?$

17. $\frac{72\times 54}{12}=?$

1. How many pints are there in 568 gallons?

2. A grocer buys cinnamon at $.50 a pound and sells it at 5 cents an ounce. *a.* How much does he gain on a pound? *b.* On 53 pounds?

3. 60,000 lb. of coal at $5 per ton cost how much?

4. I work 28 days at $2.50 a day and take 14 tons of coal for my pay. *a.* How much is my labor worth? *b.* How much a ton do I pay for the coal?

5. Subtract the sum of $5\frac{1}{2}$ and $7\frac{1}{4}$ from the sum of $8\frac{5}{8}$ and $9\frac{3}{16}$.

6. A man bought 3 sacks of flour at $1.65 per sack, and 4 bu. of corn at $.75 per bushel. How much change should he receive from a ten-dollar bill?

Quick Test

1. How many gills in 5 quarts?

2. In how many hours can you walk 12 miles if it takes you 15 minutes to walk one mile?

3. What is the cost of 24 quarts of clover seed at $1 a peck?

4. Theodore picked 15 quarts of berries and sold $\frac{2}{3}$ of them at 10 cents a quart. How much did he receive?

5. What is the smallest number that exactly contains either 3, 4, or 6?

6. What is the difference between $\frac{5}{6}$ and $\frac{5}{12}$?

7. Two and one half quarts of milk taken from a can containing 2 gal. leaves how many quarts?

8. $4800 \div 20 = ?$ 9. $25 \times 20 = ?$ 10. $12 + 3\frac{1}{3} = ?$

1. A square foot is how many inches long? Wide? It contains how many square inches?

2. Draw a square foot on the blackboard, cut it into square inches. How many are there?

3. A square yard is how many feet long? Wide? How many square feet does it contain? Show it by a drawing on the blackboard.

4. A square rod is how many yards long? Wide? What would you do to find how many square yards there are in 1 square rod? $5\frac{1}{2} \times 5\frac{1}{2} = 30\frac{1}{4}$. How many square yards in one square rod?

5. About how many square rods are there in the floor of your schoolroom?

6. A piece of land 8 rods wide and 20 rods long contains an acre of ground. How many square rods does it contain? How many square rods make an acre? Make on the blackboard a drawing of this piece of land, using 1 inch for 1 rod. Make it into lots 4 rd. wide and 8 rd. long. These are good-sized city lots. How many are there?

7. If your school ground is 132 feet from front to rear and 165 feet along the street, it contains a half acre. How many square feet does it contain?

8. Draw a picture of a field 28 rods long and 24 rods wide, using $\frac{1}{4}$ inch for a rod. How many square rods does it contain?

9. Draw a picture of a floor 35 feet long, containing 1050 square feet. Use $\frac{1}{2}$ inch for 1 foot. How wide is the floor?

THE TABLE OF SURFACE MEASURE

144 square inches (sq. in.) make 1 square foot
9 square feet (sq. ft.) make 1 square yard
30¼ square yards (sq. yd.) make 1 square rod
160 square rods (sq. rd.) make 1 acre (A.)

NOTE. — In working the following examples, first answer to yourself these questions about each one: *a. What is given? b. What am I asked to find? c. Will the answer be greater or less than the number given?*

Oral

1. How many square inches in 12 sq. ft.?
2. How many square rods in ¼ A.?
3. A floor 4 yd. long and 3 yd. wide contains how many square yards? How many square feet?
4. The front of a desk drawer is 20 in. long and 5 in. wide. It contains how many square inches?

Written

1. How many square feet in 437 sq. yd.?
2. How many square inches in 94 sq. ft.?
3. How many square yards in 48 sq. rd.?
4. How many square rods in 26 A.?
5. How many square yards in 3933 sq. ft.?
6. How many square feet in 13536 sq. in.?
7. How many acres in 4160 sq. rd.?
8. Change: *a.* 124 A. to square rods; *b.* 36 sq. rd. to square yards; *c.* 523 sq. yd. to square feet; *d.* 12 sq. ft. to square inches; *e.* 1 A. to square rods, to square yards, to square feet, to square inches.

1. *The area of a rectangle is always the product of what two factors?*

2. *The number of square inches in a rectangle is the product of what two numbers?*

3. *The number of square yards in a rectangle is the product of what two numbers?*

4. *When a product and one of its factors are given, how can you find the other factor?*

5. The length of a map is 8 feet. Its width is $5\frac{1}{2}$ ft. What is its area?

6. A piece of pasteboard 20 inches long must be how wide to contain 120 square inches?

7. A rug 3 yd. wide and 4 yd. long covers how many square yards of floor? How many square feet?

8. A flag is 3 yd. long and 2 yd. wide. It is how many feet long? Wide? Find in two ways the number of square feet in it. Make pictures to prove your work.

9. A door mat is 20 inches by 30 inches. Find its area.

10. Mrs. Smith's rose bed is 2 yd. wide and covers 48 sq. yd. of ground. How long is it? Find its perimeter.

11. Mr. English has a lawn 3 rd. by 5 rd. In one corner is a summer house covering $1\frac{1}{4}$ sq. rd. and in another corner a fern bed covering $\frac{3}{4}$ sq. rd. How much surface is left for grass? (Picture, using 1 in. for 1 rd.)

12. Herbert has a pansy bed 4 ft. by 12. There are 2 plants in every square foot of ground. How many plants in the bed?

Change:

1. 96000 sq. rd. to acres. 2. 5616 sq. in. to square feet.
3. 3429 sq. in. to square feet and square inches.
4. 1683 sq. ft. to square yards.
5. 4346 sq. ft. to square yards and square feet.
6. 1837 sq. rd. to acres and square rods.
7. 13 sq. ft. 72 sq. in. to square inches.
8. 43 sq. yd. 7 sq. ft. to square feet.
9. 48 sq. rd. 13 sq. yd. to square yards.
10. 12 sq. yd. 4 sq. ft. to square inches.
11. 14256 sq. in. to square feet; to square yards.
12. Find the area of a door mat 25 in. by 36 in.
13. Mr. Welton's cornfield is 25 rd. by 32 rd. *a.* How many square rods of land in the field? *b.* How many acres? *c.* How much corn does it yield at the rate of 46 bu. per acre? *d.* How much is the corn worth at $.60 per bushel?
14. A rectangular farm which is half a mile long must be how wide to contain 100 acres?

HINT. — The farm must contain how many square rods? It is how many rods long?

15. How many square inches in the top of a table that is 4 ft. long and 3 ft. wide?
16. At 45 cents a square yard, what would be the cost of matting to cover a floor 15 ft. by 18 ft.? (This may be found in three ways.)
17. 6 A. is how many square rods more than $4\frac{1}{4}$ A.?

1. Mr. Hadley owned a piece of land 39 rd. by 24 rd. How many square rods had he left after selling $\frac{3}{4}$ of an acre?

2. A square mile is how many rods long? Wide?

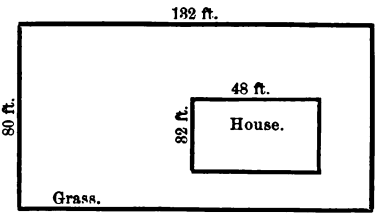
a. It contains how many square rods?

b. It contains how many acres?

3. A rectangular church floor is 84 ft. long and 48 ft. wide. It covers how many square yards of land?

4. A square park is $\frac{1}{4}$ mi. on a side. *a.* How many square rods does it contain? *b.* How many square yards? *c.* How many acres? *d.* How much is it worth at $200 per acre?

5. *a.* How many square feet are there in this entire lot? *b.* How many square feet of ground are occupied by the house? *c.* How many square feet of grass are there?



6. A man cut an acre of land into 5 building lots and sold four of them. The first contained $27\frac{3}{4}$ sq. rd., the second 36 sq. rd., the third $30\frac{5}{12}$ sq. rd., the fourth $29\frac{5}{6}$ sq. rd. The fifth one he kept. *a.* How many square rods of land did the man sell? *b.* How much land did he keep?

7. Mrs. Rich bought a rug 12 ft. by 18 ft., and another 15 ft. by 21 ft. How many square yards of floor will both rugs cover?

8. What is the cost of a sidewalk 6 ft. wide in front of three fifty-foot lots if it costs 14 cents a square foot?

Add:

1.	2.	3.	4.	5.
397	$138.49	768	$12.99	4086
498	6.52	546	6.28	9798
684	8.79	987	143.72	8469
963	7.56	645	24.08	3578
589	109.84	867	16.49	5946
786	3.58	988	4.45	9894
999	17.75	789	9.78	8765

6.	7.	8.	9.	10.
$5\frac{7}{8}$	$9\frac{3}{8}$	$14\frac{5}{12}$	$13\frac{2}{3}$	$16\frac{3}{10}$
$4\frac{3}{4}$	$4\frac{5}{6}$	$13\frac{2}{3}$	$5\frac{7}{9}$	$15\frac{4}{5}$
$7\frac{1}{2}$	$8\frac{2}{3}$	$15\frac{3}{4}$	$3\frac{5}{6}$	$12\frac{1}{2}$
$3\frac{5}{16}$	$5\frac{3}{4}$	$2\frac{5}{6}$	$4\frac{7}{18}$	$11\frac{3}{20}$

Subtract:

11.	12.	13.	14.	15.
$14\frac{7}{9}$	$7\frac{5}{6}$	$17\frac{3}{4}$	18	24
$6\frac{2}{3}$	$4\frac{2}{9}$	$3\frac{1}{6}$	$14\frac{3}{8}$	$21\frac{13}{18}$

Multiply:

16.	17.	18.	19.	20.
729	897	976	298	365
38	89	76	49	75

Find the values:

21. $\frac{4368}{78}$ 22. $\frac{1908}{18}$ 23. $\frac{1829}{17}$ 24. $\frac{3264}{16}$ 25. $\frac{2625}{25}$

26. Add the difference between 9835 and 4768 to the difference between 694 and 138.

27. Divide the product of 96 and 55 by the product of 11 and 12.

1. What is the cost of 30 tons of hay at \$15 a ton?

2. If 7 acres of land cost \$200, what will 14 acres cost?

3. 3200 ounces make how many pounds?

4. When $\frac{1}{2}$ lb. of tea costs 20¢, what must be paid for $\frac{1}{4}$ of a pound? For $\frac{3}{4}$ of a pound?

5. A owns $\frac{1}{2}$ of a farm and B $\frac{3}{7}$ of it. What part of the farm do both own? If C owns the remainder, what part of the farm does C own?

6. Will has \$$2\frac{1}{4}$ and James \$$3\frac{1}{2}$. How many dollars have both? How much less than \$10?

7. What is the smallest multiple of 5, 2, 10, and 4?

Written

1. 8 bu. of cranberries were put in quart boxes and sold at 14 cents a box. *a*. How many boxes were there? *b*. How much did they bring?

2. How many pints in 5 bu. of birdseed?

3. How many ounce weights will just balance 8 lb.?

4. What will it cost at 18¢ a square yard to pave a cellar 54 ft. by 33 ft.?

5. How many hundredweight in 5 sacks of feed, each containing 120 lb.?

6. How many square feet in 246 sq. yd. of paper?

7. Change 24 rods to yards and then to feet.

8. A farmer sold $\frac{1}{8}$ of his flock of 640 sheep. *a*. How many did he sell? *b*. How many did he keep?

1. $\frac{7}{8}$ is how many 24ths?

2. $\frac{7}{9}$ is how many 18ths?

3. Add $\frac{1}{4}$ and $\frac{1}{5}$. Subtract $\frac{1}{5}$ from $\frac{1}{4}$.

4. Multiply 12 by $4\frac{1}{4}$. (Problem.)

5. A rectangle 3 ft. wide, containing 24 sq. ft., is how long? What is its perimeter?

6. How many square inches in a 5-inch square?

7. How many rods of fence will inclose a field $10\frac{1}{2}$ rods square?

8. A cask holds $48\frac{3}{4}$ gal. of water. If $20\frac{1}{2}$ gallons leak away, how many gallons remain?

Written

1. What must be paid for 12 tons of grate coal at \$5.35 a ton and 4 tons of chestnut coal at \$5.50 a ton?

2. If 10 men earn \$120 a week, what will 6 men earn at the same rate?

3. Elsie spent $\frac{1}{4}$ of \$5 for a book and the remainder for a pair of shoes. What did the shoes cost?

4. At \$.80 a gallon, what is the cost of 10 qt. of ice cream?

5. A clock that ticks twice every second ticks how many times in an hour?

6. If a bushel of corn weighs 56 lb., how many bushels of corn in a car load weighing 14 tons?

7. 1568 oz. = how many pounds?

1. If $\frac{1}{4}$ of a pound of coffee costs 9 cents, what will 2 lb. cost?

2. 240 bu. of oats at \$.48 per bushel will pay for 16 barrels of flour at what price per barrel?

3. How many square yards in 4 sq. rd.?

4. Read DCCXXVIII.

5. How many square feet in 100 square yards?

6. 3 qt. are what part of a peck?

7. How many days in July and August?

Written

1. A merchant bought 44 yd. of silk for \$39.16 and sold it so as to gain \$16.72. *a.* For how much did he sell it? *b.* At what price per yard did he sell it? *c.* At what price per yard did he buy it? *d.* What did he gain on a yard?

2. How many half-bushel baskets will hold 400 qt. of cranberries?

3. Mr. Rich sold his horse for \$275 and his carriage for \$125. He then bought an automobile for 5 times as much as he received for the horse and carriage. What did the automobile cost?

4. A farmer shipped to the city 32 cans of milk, each can containing 40 quarts. *a.* How many gallons did he ship? *b.* What was it worth at $2\frac{1}{2}$ cents a quart?

5. How many yards of cloth in 3 remnants containing $\frac{1}{2}$ yd., $2\frac{2}{3}$ yd., and $5\frac{1}{4}$ yd. respectively?

1. Name 5 factors of 30. 2. $5 \times ? \times 7 = 70$.

3. At 6 cents an ounce, what must be paid for a pound of cloves?

4. Of what numbers is 77 a multiple?

5. At 10 cents a day, what is the cost of milk for a family during the month of May? April?

6. Read 3,050,120.

7. Name the letters used in Roman Notation and give the value of each.

Written

1. If 12 men earn $2880 in a certain time, how much could 6 men earn in the same time?

2. Add nine dollars five cents, fourteen dollars sixteen cents, forty-eight cents, two dollars five cents, and seventeen dollars fifteen cents.

3. *a.* How many rods in $\frac{1}{4}$ of a mile? *b.* How many feet?

4. Express in words 5,003,016.

5. The divisor is 234 and the quotient 108. What is the dividend?

6. What must be added to $63.75 to make $178.13?

7. Find quotients and remainders and test your work:

a. $\frac{34976}{186}$ *b.* $\frac{42695}{268}$ *c.* $\frac{397518}{137}$ *d.* $\frac{860751}{614}$

e. $\frac{425639}{253}$ *f.* $\frac{129675}{431}$ *g.* $\frac{683912}{915}$ *h.* $\frac{263+592}{19}$

8. Make a problem for $6375 \div 25$.

PART IV

NOTATION AND NUMERATION

That which tells how many is **number**; *e.g.* 11, 14 (books), 25 (cents).

One is a **unit**; *e.g.* 1 dollar, 1 house, one.

Every number is made up of units. Three contains 3 units. Twenty contains 20 units. One hundred twelve is made up of 112 units.

Expressing numbers in figures or letters is **notation**; *e.g.* 7, 29, 314, VII, XXIX.

Expressing numbers by means of figures is **Arabic notation**; *e.g.* 13, 4728, 23806.

1, 2, 3, 4, 5, 6, 7, 8, and 9 are called significant figures, because each figure has a value.

The figure 0, called *zero*, or *naught*, has no value, but is used to give the significant figures their proper places in a number.

Expressing numbers by means of letters is **Roman notation**; *e.g.* VIII, CD, XCIV.

A number that is composed entirely of whole units is an **integer**; *e.g.* 6, 8, 13.

One or more of the equal parts of a unit is a **fraction**; *e.g.* $\frac{2}{3}$, $\frac{7}{8}$, $\frac{25}{100}$.

ARABIC NOTATION

Names of Periods.			Billions			Millions			Thousands			Units		
Names of Places.	Hundred-billions	Ten-billions	Billions	Hundred-millions	Ten-millions	Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Units
	4	6	5,	2	0	9,	3	1	5,	0	8	7

This number is read, *four hundred sixty-five billion, two hundred nine million, three hundred fifteen thousand, eighty-seven.*

A comma (,), sometimes called a **separatrix**, is used between periods to aid in reading numbers.

Oral

1. Name the periods in this number. Name the places.
2. How many periods are there? How many places?
3. How many places are there in each period?
4. How does the name of each period compare with the name of its right-hand place?

Written

Express in figures:

1. Two hundred thousand, sixteen.
2. Eleven thousand, two.

3. Four million, six hundred eight thousand, three hundred seventy-five.

4. Twenty-five thousand, seven.

5. Nineteen thousand, seventeen.

6. Twenty-seven million, six hundred fifty.

7. Eighty million, six hundred nine thousand, four hundred twenty-eight.

8. Six hundred twenty million, seventeen thousand, four hundred seventy-seven.

9. Four hundred thirty-six thousand, fifty-one.

10. One hundred fifty-seven million, six hundred eight thousand, four hundred seventy-seven.

11. Three billion, fifty-seven million, four hundred seventeen thousand, sixty.

12. Write a number containing five places.

13. Write a number containing three periods. How many places does it contain?

14. Write a number containing three periods in which the thousands' period has no value.

NUMERATION

Naming the places of figures and reading numbers is **numeration**. Thus, to numerate 43,008,160, we should say "Units, tens, hundreds, thousands, ten-thousands, hundred-thousands, millions, ten-millions — forty-three million eight thousand one hundred sixty."

Numerate the numbers below:

1.	385	4.	315,129	7.	8,460,000
2.	1,421	5.	6,785,342	8.	423,000,501
3.	25,678	6.	35,000,730	9.	8,003,040,631

REVIEW AND EXTENSION OF ADDITION

Addition *is the process of uniting two or more numbers into one number; e.g.* $2 + 5 = 7$.

The numbers added are **addends**; *e.g.* $3 + 10 = 13$; 3 and 10 are the addends.

The result of addition is the **sum**; *e.g.* 8 books and 7 books are 15 books; 15 is the sum.

The addends and the *sum* are called the **terms of addition.**

Oral Examples:

Add:

1.

3	45
5, 7	42
2, 8	30
6, 6	20
8	8
45	

NOTE. — In adding a column, always look for combinations of two or three figures whose sum may be taken as an addend. Thus, in finding the sum in Example 1, say 8, 20, 30, 42, 45.

Read the column downward, making similar combinations.

Add:

2.	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**
4	9	5	6	8	8	5	8
5	4	9	6	7	6	7	2
5	6	6	7	9	5	6	4
5	2	4	6	2	2	4	6
2	7	3	8	9	3	3	7
3	5	5	2	1	7	2	3
4	8	2	7	6	9	4	8
3	4	4	5	7	1	6	4
9	3	5	6	3	8	9	7
8	1	4	7	8	7	3	6

10. *Add* 25 *and* 47.

$25 + 40 = 65$. $65 + 7 = 72$. *Ans.* Say 25, 65, 72.

In a similar way find the sums indicated in exercises 11–25:

11. $28 + 26$	**16.** $62 + 28$	**21.** $62 + 24$
12. $42 + 75$	**17.** $57 + 36$	**22.** $65 + 34$
13. $63 + 29$	**18.** $72 + 29$	**23.** $53 + 46$
14. $27 + 38$	**19.** $35 + 26$	**24.** $64 + 44$
15. $45 + 34$	**20.** $44 + 38$	**25.** $73 + 27$

26. A drover bought 8 cows, 5 horses, and 10 sheep. How many animals did he buy?

27. Fred paid 10 dollars for a goat, and 12 dollars for a cart. How much did both cost him?

28. In a certain class 28 pupils were present, 5 were absent on account of sickness, and 4 were absent for other reasons. How many pupils belong to the class?

Written Examples:

Add, and test your work by adding downward:

1.	**2.**	**3.**	**4.**	**5.**
28	639	1050	126	$115.85
39	874	394	149	327.15
76	596	769	1260	495.27
42	421	564	1004	160.03
89	397	285	986	598.09
73	269	784	24	784.06

6.	**7.**	**8.**	**9.**	**10.**
97	857	283	$208.40	$356.24
98	943	2075	32.03	35.09
79	268	298	26.07	2.15
68	207	963	18.94	30.05
40	976	859	236.29	5.16
87	888	876	28.15	304.29

11.	12.	13.	14.
2673	837	628	8063
846	2964	4307	259
1025	418	526	8264
92	3825	8279	1287
837	842	428	428
642	29	4273	3064
4983	561	746	42379
8698	29	394	6507
2789	387	786	93289

15. Three boys went fishing, and caught 16 perch, 19 pickerel, and 8 black bass. How many fish did they catch in all?

16. Two trains starting from the same place ran two days in opposite directions. One ran 530 miles the first day and 525 miles the second, while the other ran 492 miles the first day and 510 miles the second. How far apart were they at the end of the two days? (Illustrate by a picture.)

17. A man bought coal for $5.60, wood for $3.45, and a stove for $45. What was the whole cost?

18. There are 112 bushels of wheat in one bin, 175 in another, and 234 in the third. How many bushels in all?

19. There are 218 pages in my reader, 245 in my arithmetic, 195 in my geography, and 189 in my language book. How many pages in the four books?

The sum of all the sides of a figure is its **perimeter.**

1. Find the perimeter of a figure whose sides are 39 inches, 45 inches, 28 inches, 56 inches, 75 inches, and 17 inches.

2. What is the perimeter of a seven-sided piece of land whose sides are 209 feet, 683 feet, 129 feet, 463 feet, 928 feet, 93 feet, and 290 feet? (Illustrate.)

REVIEW AND EXTENSION OF SUBTRACTION

Subtraction *is the process of finding the difference between two numbers; e.g.* 21 − 7 = 14; 13 cents − 5 cents = 8 cents.

The number from which we subtract is the **minuend.** *The number subtracted* is the **subtrahend.** *The result of subtraction* is the **difference** or **remainder;** *e.g.* 17 − 9 = 8. 17 is the minuend, 9 is the subtrahend, and 8 is the difference or remainder.

The difference is always the number that must be added to the subtrahend to obtain the minuend.

The minuend, subtrahend, and remainder are called the **terms of subtraction.**

Oral Examples:

From 83 take 57.

83 − 50 = 33. 33 − 7 = 26. *Ans.* Say 83, 33, 26.

In a similar way find the differences indicated in exercises 1–15:

1. 38 − 19	**6.** 72 − 26	**11.** 63 − 25
2. 27 − 18	**7.** 66 − 37	**12.** 48 − 19
3. 42 − 15	**8.** 92 − 48	**13.** 51 − 27
4. 61 − 22	**9.** 87 − 39	**14.** 84 − 47
5. 81 − 36	**10.** 42 − 29	**15.** 75 − 39

16. Frank lives 12 blocks from school, and Henry 5 blocks in the same direction. Their homes are how many blocks apart? How many blocks apart would they be if Henry lived 5 blocks from school in the opposite direction? (Illustrate.)

17. Mary added two numbers, and the sum was 28. One of the numbers was 16. What was the other?

18. If you pay 15 cents toward the purchase of a slate costing 20 cents, how much do you still owe?

19. 20 is how much more than 11?

20. Lucy is 20 years old, and her sister is 6 years younger. How old is her sister?

21. What number must be subtracted from 43 to leave 25?

22. John's heart beat 78 times a minute when he was well, but 130 times a minute during a severe illness. How much faster did his heart beat during illness than in health?

Written Examples:

To test the work in subtraction, add the subtrahend and remainder. If the minuend is obtained, the work is correct. Do not write the numbers again, but make the test with the numbers as they stand.

In what other way may we test subtraction?

Subtract and test results:

1.	2819 674	**2.**	8203 1276	**3.**	4295 597	**4.**	7306 1807
5.	2763 1289	**6.**	37284 9287	**7.**	36801 18463	**8.**	18003 921
9.	92874 11392	**10.**	94210 8206	**11.**	42840 38706	**12.**	98301 26942
13.	38264 29842	**14.**	19327 8291	**15.**	92593 87246	**16.**	27075 18092
17.	$2.15 1.12	**18.**	$35.28 17.05	**19.**	$25.18 1.15	**20.**	$36.51 16.82
21.	$34.28 24.28	**22.**	$39.21 27.13	**23.**	$17.80 16.75	**24.**	$75.00 24.32

25. From seventeen thousand sixteen, take nine thousand four hundred eighty-seven.

26. Take eight thousand four from thirty thousand.

Oral

1. Read 359,016,007,138; $3,894,760.15; 1,010,101.

2. Read CLIX; DCCXXXVI; CMXIII.

3. Numerate 3,057,608.

4. Jennie bought a skein of Shetland floss for 10 cents, 3 skeins of embroidery silk for 12 cents, and a pair of knitting needles for 10 cents. How much change should she receive from a 50-cent piece?

5. Albert has earned 15 cents, 25 cents, and 17 cents toward a pair of gloves that cost $1. How much more money must he obtain in order to pay for the gloves?

6. The sum of 3 numbers is 100. Two of them are 29 and 37. What is the other?

Written

1. A farmer having 456 bushels of corn sold 84 bushels to one man and 135 bushels to another. How many bushels did he have left?

2. A man started to walk 112 miles in three days. He walked 32 miles the first day, and 41 miles the second. How far must he walk the third day to complete the journey?

3. I bought a cow for $42, another for $48, and a third for $56. For how much should I sell them to gain $28?

4. A lady bought sugar for 65 cents, tea for 55 cents, molasses for 72 cents, butter for 84 cents, starch for 25 cents, and gave in payment a five-dollar bill. How much change should she receive?

5. The distance by rail from Galveston to San Antonio is 572 miles, from San Antonio to Tucson 932 miles, and from Tucson to Los Angeles 501 miles. What is the distance by rail from Galveston to Los Angeles?

6. Two vessels start from points 850 miles apart and sail toward each other. How far apart are they when one has sailed 246 miles and the other 352 miles? (Illustrate.)

7. A man sold one horse for $145 and another for $182. On the first he gained $23, and on the second $36. What was the cost of both?

8. A boy bought apples for $.45 and pears for $.62, and sold them all for $1.50. What was his profit?

9. John sold 62 newspapers, Frank 48, and Henry 27 less than both of them. How many did Henry sell?

10. A grocer sold butter for $45 and cheese for $62. On the butter he lost $6 and on the cheese he gained $14. What was the cost of both?

11. A farmer bought a barrel of flour for $6.35, sugar for $2.15, coffee for $1.46, tea for $1.20, and gave in payment $3.15 worth of butter and the remainder in cash. What did he pay in money?

12. The sum of 52 and 64 is how much greater than the difference between 124 and 69?

13. From a flock of 320 sheep 76 were sold at one time and 112 at another. How many remained?

14. A man bought 148 bushels of potatoes from A, 216 bushels from B, 183 bushels from C, and afterwards sold all but 137 bushels. How many bushels did he sell?

15. The sum of three numbers is 342. Two of the numbers are 84 and 96. What is the third number?

16. John's father gave him $2.25, and his uncle gave him $1.40. He earned enough besides so that he bought, with the whole, a suit of clothes for $8. How much did he earn?

17. Claude took 987 steps in coming to school, Francis 865, and Alice 398 less than the number taken by both the boys. How many steps did all three take?

18. A ship loaded with iron sailed from Cleveland to a port 332 miles west of that city. A car loaded with machinery at Cleveland was taken to a city 619 miles east of Cleveland. How far apart were the ship and the car when each had reached the end of its trip? (Illustrate.)

19. The first Thanksgiving was in 1621 and the day has been observed every year since. How many times has the day been observed?

20. A father and his three sons earned $2461 in a year. The first son earned $676, the second $456, and the father $1080. How much did the third son earn?

21. A train started from Chicago with 324 passengers. On the way to St. Paul 185 passengers left the train, and 149 came aboard. How many passengers were on the train when it reached St. Paul?

22. A retail grocer bought at a wholesale grocery three barrels of apples for $4.50, a box of lemons for $2.70, and three barrels of flour for $12.30. He handed the wholesale grocer one gold piece and received 50 cents in change. What was the value of the gold piece?

23. During one week, a man put into the bank $687, drew out $489, put in $348, drew out $298, and then had $1386 left in the bank. How much had he in the bank at first?

24. A farmer having 215 acres of land, used 21 acres for corn, 36 for oats, 29 for barley, 18 for potatoes, 52 for meadow, and the rest for pasture. How many acres were used for pasture?

REVIEW AND EXTENSION OF MULTIPLICATION

Multiplication *is taking one number as many times as there are units in another; e.g.* 6 times 9 are 54.

The multiplier, multiplicand, and product are called the **terms of multiplication.** (See page 62 for definitions.)

The product is the same in whatever order the factors are taken; *e.g.* 6 times 7 are 42, and 7 times 6 are 42; $3 \times 5 \times 4$ are 60 and $4 \times 3 \times 5$ are 60.

Oral

3	4	5	2	6	1	8	0	7	12	10	11	9
7	12	9	0	11	5	10	4	1	3	6	2	8

1. Multiply each number in the upper line by every number in the lower line.

2. How do we multiply a number by 10? By 100? By 1000?

3. Multiply 7 by 10; by 100; by 1000.

4. Multiply 34 by 10; by 100; by 1000.

5. Multiply 11 by 3; by 30; by 300.

6. Multiply 12 by 7; by 70; by 7000.

7. The product is a multiple of the multiplicand. Of what other number is it a multiple?

8. Of what number is 33 a multiple?

Give the products at sight:

9.	10.	11.	12.	13.
86	307	315	73	32
7	5	10	100	20

Written

Multiply $34.79 by 806.

$$\begin{array}{r} \$34.79 \\ 806 \\ \hline 20874 \\ 27832 \\ \hline \$28040.74 \end{array}$$

Observe that the right-hand figure of each partial product is written directly under the figure by which we multiply to obtain it. Cents in either factor give cents in the product.

1. 324×24	**15.** 296×28	**29.** $\$280.52 \times 236$
2. 296×39	**16.** 694×39	**30.** $\$356.04 \times 328$
3. 387×45	**17.** 206×54	**31.** $\$987.62 \times 475$
4. 263×56	**18.** $\$28.15 \times 28$	**32.** $\$396.41 \times 641$
5. 892×63	**19.** $\$34.98 \times 27$	**33.** $\$806.04 \times 879$
6. 728×75	**20.** $\$19.84 \times 46$	**34.** 238×307
7. 398×84	**21.** $\$7.85 \times 124$	**35.** 5126×208
8. 987×98	**22.** $\$28.75 \times 15$	**36.** 934×9000
9. 516×31	**23.** $\$36.91 \times 45$	**37.** 1027×2005
10. 798×43	**24.** $\$126.93 \times 87$	**38.** 386×1080
11. 896×79	**25.** $\$17.85 \times 48$	**39.** 527×2300
12. 598×36	**26.** $\$19.63 \times 49$	**40.** 4008×7003
13. 287×49	**27.** $\$75.10 \times 97$	**41.** $\$29.05 \times 108$
14. 799×99	**28.** $\$16.35 \times 764$	**42.** 4040×8356

43. *a.* What is the perimeter of a square farm whose side is 309 rods? *b.* What is its area?

44. *a.* If it costs $4.78 a day to support a certain family, how much does it cost for a month of 31 days? *b.* How much does it cost for a month of 28 days? *c.* How much does it cost for a year?

45. There are 2000 pounds in one ton. How many pounds are there in 496 tons? (Solve it in the shortest way.)

REVIEW AND EXTENSION OF DIVISION

Division is the *process of finding one of two factors when the other factor and the product are given; e.g.* 35 is the product of 5 and 7. When 35 and 5 are given, we divide 35 by 5 to obtain 7; when 35 and 7 are given, we divide 35 by 7 to obtain 5.

The *dividend*, *divisor*, and *quotient* are called the **terms of division.** (See page 65 for definitions.)

Oral

1. 6 oranges at 3 cents each cost 18 cents. Which of these numbers is a product? Which are factors? When 18 and 6 are given, how can 3 be found? When 18 and 3 are given, how can 6 be found? When 3 and 6 are given, by what operation can 18 be found?

2. The area of a page of Henry's book is 35 square inches. If the length is 7 inches, what must be the width? If the width is 5 inches, what must be the length? 35 is which term in the division? 35 is what of 5 and 7?

3. There are 9 square feet in 1 square yard. How many square yards are there in 108 square feet? 108 is the product of 9 and what other number? 108 is which term in the division? 108 is what of 9 and 12?

4. What is

a. The number of feet in 132 inches?

b. The number of pecks in 72 quarts?

c. The cost of a month's rent at $120 a year?

d. The number of weeks in 77 days?

e. The price of a lawn mower, when 15 mowers cost $150?

5. Fred paid 54 cents for some sugar. The number of cents that a pound cost is one factor of 54. What is the other factor? What, besides 54 cents, must be given in order that we may

find the cost of one pound? What, besides 54 cents, must be given in order to find the number of pounds Fred bought?

6. The first number in each line below is a factor of every other number in the line. Find the factor not given of each number:

a. 5: 15; 75; 355; 525; 405
b. 7: 84; 217; 280; 763; 497
c. 11: 110; 44; 121; 880; 2211
d. 9: 819; 945; 189; 360; 963
e. 8: 64; 328; 176; 728; 960

7. In the following statements tell which numbers are factors and which are products:

a. There are —— peaches in 7 baskets if each basket contains 12 peaches.

b. 12 quarts of berries cost 96 cents.

c. Jerome's wages for 9 weeks at $—— a week amounted to 27 dollars.

d. 6 fountain pens at $3 apiece cost $——.

e. $1 will pay 20 car fares at —— apiece.

f. 72 cents will buy 12 pounds of sugar at —— cents a pound.

Written

1. Divide 495,018 by 534.

927 *Quotient.*
534)495018
4806
1441
1068
3738
3738

We get the quotient figures by saying, "How many 5's in 49, in 14, in 37?"

NOTE. — In dividing by any number not larger than 12, short division should be used. That is, no work should be written except the dividend, divisor, and quotient. In such examples the quotient may be written either above or below the dividend according to convenience. If the dividend contains cents, and the divisor is a whole number, the quotient also contains cents. (See page 132 for *remainder* and *test*.)

Solve examples 2–66, and test your work by multiplying the quotient by the divisor and adding the remainder, if there is one, to obtain the dividend:

2. $2832 \div 2$
3. $6729 \div 3$
4. $4503 \div 3$
5. $2045 \div 5$
6. $2835 \div 7$
7. $4986 \div 9$
8. $2009 \div 7$
9. $3504 \div 8$
10. $\frac{61938}{9}$
11. $\frac{28348}{7}$
12. $\frac{59840}{4}$
13. $\frac{12358}{2}$
14. $\frac{58345}{5}$
15. $\frac{11007}{9}$
16. $\frac{13696}{4}$
17. $\frac{29365}{7}$
18. $\frac{98346}{6}$
19. $30{,}005 \div 5$
20. $288{,}012 \div 12$
21. $300{,}010 \div 10$
22. $99{,}011 \div 11$
23. $33{,}264 \div 11$
24. $29{,}280 \div 12$
25. $36{,}550 \div 10$
26. $28{,}692 \div 9$
27. $333{,}333 \div 11$
28. $35{,}621 \div 7$
29. $42{,}963 \div 6$
30. $50{,}725 \div 3$
31. $82{,}956 \div 10$
32. $93{,}043 \div 7$
33. $65{,}407 \div 5$
34. $39{,}842 \div 9$
35. $27{,}392 \div 8$
36. $63{,}594 \div 9$
37. $31{,}493 \div 6$
38. $25{,}324 \div 5$
39. $28{,}764 \div 4$
40. $36{,}099 \div 9$
41. $14{,}412 \div 12$
42. $36{,}930 \div 11$
43. $24{,}003 \div 6$
44. $30{,}502 \div 8$
45. $29{,}333 \div 11$
46. $675{,}262 \div 5$
47. $349{,}872 \div 8$
48. $130{,}052 \div 2$
49. $168{,}754 \div 9$
50. $385{,}980 \div 5$
51. $769{,}520 \div 7$
52. $387{,}052 \div 10$
53. $943{,}769 \div 12$
54. $12{,}978 \div 42$
55. $31{,}509 \div 81$
56. $40{,}948 \div 58$
57. $68{,}476 \div 68$
58. $168{,}665 \div 427$
59. $190{,}855 \div 931$
60. $293{,}004 \div 801$
61. $129{,}324 \div 756$
62. $3{,}247{,}654 \div 79$
63. $294{,}490 = 98 \times ?$
64. $503 \times ? = 637{,}804$
65. 58,487 has what factor besides 143?
66. $? \times 215 = 66{,}220$

REVIEW AND PRACTICE

Oral

1. A farmer exchanged 12 barrels of apples at $3 a barrel for coal at $4 a ton. How many tons of coal did he receive?

2. In what time will a boy earn as much at $3 a week, as a man earns in 6 weeks at $8 a week?

3. Nell is 3 years old and Will 5. Their sister's age is twice the sum of their ages. What is the sister's age?

4. How many gallons of milk will a family use in the month of June if they use 2 quarts a day?

5. Frank rides 6 miles an hour and Albert 9. *a.* How far apart will they be in 6 hours if they start at the same time and place and ride in the same direction? *b.* If they ride in opposite directions?

6. Grace bought 2 dozen lemons. She used $\frac{3}{8}$ of them for lemonade and gave away 6. How many remained?

7. Helen bought $\frac{7}{8}$ of a yard of cambric. She used half a yard in her dress and wasted $\frac{1}{8}$ of a yard in cutting. How much was left?

8. A man owed $96. He made 5 payments of $12 each. How much did he then owe?

9. Luther has $6 and Leon 3 times as much. How much have both?

10. $18 plus $12 is how much less than 4 times $12?

11. The product is 125 and one of the factors is 5. What is the other factor?

12. The divisor is 11, the quotient 12, and the remainder 9. What is the dividend?

13. The dividend is 85, the quotient 9, and the remainder 4. What is the divisor?

14. How many days will a 12-gallon keg of water last 24 shipwrecked men if each man drinks a pint a day?

15. If Frances can knit 21 stitches a minute, how many stitches can she knit in half an hour?

16. The product of 20 and 16 is how much less than 20 times 20?

Written

1. How many tons of coal at $5 a ton will pay for 15 tons of hay at $11 a ton?

2. A man started on a journey of 724 miles. After he had traveled 12 hours at the rate of 32 miles an hour, how far was he from his journey's end?

3. A farmer bought six sacks of flour at $1.25 a sack, 25 pounds of sugar at 6 cents a pound, and two pounds of coffee at 30 cents a pound. He paid for it in butter at 24 cents a pound. How many pounds of butter were there?

4. A man having $738.58 in a bank drew out $132.75 at one time, $175.50 at another, and $216 at another. How much money then remained in the bank?

5. If the divisor is 38, the quotient 209, and the remainder 23, what is the dividend?

6. The product of three numbers is 1260 and two of them are 12 and 7. What is the third?

7. A grocer buys 88 gallons of molasses at $.56 a gallon. For what price per gallon must he sell it in order to gain $12.32?

8. The dividend is 1821, the quotient 32, and the remainder 29. What is the divisor?

9. Two trains start at the same time from points 1216 miles apart and travel toward each other, one at the rate of 35 miles

an hour, the other at the rate of 41 miles an hour. In how many hours will they meet?

10. A lady bought 12 yards of dress goods at $1.75 a yard, 8 yards of silesia at $.25 a yard, 2 pairs of gloves at $1.45 a pair, 6 handkerchiefs at $.25 apiece, and 3 yards of table linen at $.95 a yard. She paid $18.75. What did she still owe?

11. How many pounds of cheese at 14 cents a pound will pay for 3 barrels of flour at $4.20 a barrel?

12. At what rate per hour must a train run to go as far in 9 hours as another train running 27 miles an hour can go in 12 hours?

13. A farmer paid $1125 for cows, horses, and farming tools, and 8 times as much for a farm of 125 acres. What was the price per acre?

14. A farmer had 46 acres of alfalfa. He cut three crops a year. The first crop yielded $1\frac{3}{4}$ tons per acre, the second $1\frac{1}{4}$ tons, and the third 1 ton.

a. How much was it worth at $8 a ton?

b. How many pounds of alfalfa did he obtain?

15. At a certain post office there were sold in one year 12,400 twenty-five-cent stamp books; 4600 forty-nine-cent stamp books; 2250 ninety-seven-cent stamp books. How much was received for all of them?

16. A merchant owed a debt amounting to $9892. He made four payments of $1980 each. How much did he then owe?

17. A river is 2174 miles long. A steamboat started at the mouth of the river and traveled up stream for 6 days at the rate of 149 miles a day. The boat was then how far from the source of the river? (Illustrate.)

18. *a.* A rural free-delivery mail carrier on a certain route is on duty 298 days in a year and rides 24 miles each day. How far does he ride in a year?

b. He starts at 8.15 A.M. and returns home at 3.15 P.M. every day. How many hours does he spend on the road in a year?

The number of pieces of mail delivered and collected by him in one month was as follows:

	DELIVERED	COLLECTED
Registered Letters	5	3
Common Letters	1764	877
Postal Cards	436	297
Newspapers	4368	27
Circulars	507	0
Packages	105	26

c. The total number of pieces delivered was how much greater than the number collected?

d. If there were 189 families on this route, what was the average number of pieces delivered to each family?

e. If this carrier's salary is $900 a year, and it costs him $13 a month to keep his horse, how much of the salary is left to pay him for his year's work?

f. The Post-office Department of the United States pays the carrier's salary. He sells stamps to the amount of $31.50 per

month, and sends the money to the Post-office Department. The amount received from this mail route is how much less per month than the cost of delivering the mail?

19. *a.* In the year 1909 the Syracuse post-office received $570,903.20 for stamps, registering letters, writing money orders, and other postal business. The expense of carrying on the post-office was $\frac{3}{7}$ of this amount. What was the expense of carrying on the post-office?

b. How much did the Post-office Department gain on account of this post-office?

c. In this office 948 sacks and pouches of mail were handled in one day, each sack and pouch containing an average of 154 pieces of mail. How many pieces of mail were handled?

d. At the same rate, how many pieces were handled in a year?

20. *a.* Willis has 15 hens. They laid at the rate of 120 eggs apiece in one year. How many eggs were laid by all of them?

b. The food for the hens cost $21. Willis sold the eggs at an average price of 22 cents a dozen. How much more did he receive for the eggs than he paid for the food for the hens?

c. What was the profit from one hen?

d. What would be the profit from 75 hens at the same rate?

e. Willis has a rectangular hen park 30 ft. long and 15 ft. wide. How many feet of wire netting will inclose it?

21. From one hundred twenty-two thousand take eighty-seven thousand ninety-four.

INDICATED WORK

In problems requiring several operations, or steps, it is well first to indicate the operations by means of signs; *e.g.* $5208 \div 3 \times 8$ means that we are to divide 5208 by 3 and multiply the quotient by 8.

The parenthesis ( ) is sometimes used to inclose certain numbers or expressions which are to be taken together as one thing; *e.g.* $18 \times (15 + 10)$ means that 18 is to be multiplied by the sum of 15 and 10.

Operations indicated within a parenthesis should always be performed first; *e.g.* $5208 \div (3 \times 8)$ means that we are to multiply 3 by 8 and divide 5208 by the product.

When the parenthesis is not used, indicated multiplication and division should be performed before indicated addition and subtraction; *e.g.* $125 + 3 \times 18 - 46 \div 23$ means that we must multiply 3 by 18, then divide 46 by 23, then add and subtract results as indicated; thus, $125 + 3 \times 18 - 46 \div 23 = 125 + 54 - 2 = 177$.

Perform the operations indicated:

1. $5208 \div 3 \times 8$
2. $5208 \div (3 \times 8)$
3. $203 \times 607015 - 596034$
4. $203 \times (607015 - 596034)$
5. $487 + 598 + 645 - (2030 - 1435)$
6. $9346 - (6342 + 347 + 89) + 2349$
7. $9346 - 6342 + 347 + 89 + 2349$
8. $41983 - 87 \times 103 + 47$
9. $(41983 - 87) \times (103 + 47)$
10. $2310 \div 10 \times 7 + 604 \times 35$
11. $2310 \div (10 \times 7) + 604 \times 35$

12. $3056 + 9821 \div 7 \times 48 - 29$

13. $3056 + (9821 \div 7) \times (48 - 29)$

14. $(\$1.25 \times 6 + 25 \times \$.06 + 2 \times \$.30) \div 24$. See example 3, page 219.

15. $\$738.58 - (\$132.75 + \$175.50 + \$216)$. See example 4, page 219.

16. $1216 \div (35 + 41)$. See example 9, page 219.

Indicate and find results:

1. \$.75 less the sum of \$.32 and \$.18.

2. \$500 less \$275, and the result added to \$132.

3. \$18 more than the difference between \$27 and \$425.

4. The product of 1125 and 8, divided by 125.

5. The sum of 18 yards and 41 yards taken away from 4 times 69 yards.

6. The sum of 498 and 747 divided by the difference between 2342 and 2425.

7. George earns 55 cents a day and Harry 79 cents. How much do they both earn in the month of October, allowing for 4 Sundays?

8. The product of 162 and 39 divided by the difference of 87 and 61.

9. Frank's earnings for the 6 days of the week were \$.43, \$.59, \$.62, \$.79, \$.38, \$.48. How much more must he earn before he can buy a \$5 set of books?

10. The quotient of $12{,}848 \div 16$ is how much less than the number of hours in 1 year?

11. A lady bought 10 yd. of silk at \$1.10 a yard and 2 yd. of silesia at 25¢ a yard. How much change should she receive from a 20-dollar bill?

SPECIAL CASES IN MULTIPLICATION AND DIVISION

PRINCIPLES

1. *Each removal of a figure one place to the left* **increases** *its value tenfold; e.g.* $5 = 5$; $50 = 5 \times 10$; $500 = 50 \times 10$.

2. *Each removal of a figure one place to the right* **diminishes** *its value tenfold*; *e.g.* $500 \div 10 = 50$; $50 \div 10 = 5$.

Oral

1. What is the shortest way to multiply by 10? By 100? By 1000? By 10000? By 1 with any number of ciphers annexed?

2. $8 \times 10 = ?$ $8 \times 100 = ?$ $8 \times 1000 = ?$ $8 \times 10000 = ?$

3. Cutting off a cipher from the right of a number is the same as moving all the figures one place to the right. How does it affect the value of the number?

4. How many ciphers must be cut from the right of a number to divide the number exactly by 100? By 1000? By 10000?

5. Divide each of these numbers by 10:
   50; 600; 5290; 36000; 4500; 321560.

6. Divide each of these numbers by 100:
   300; 4500; 6000; 78000; 70000; 831000.

7. Divide 9600000 by 10000.

8. Multiply each of these numbers by 10, 100, and 1000:
   7; 61; 20; 310; 402; 910; 653; 1020.

Written

1. Multiply 287 by 3700.

$$\begin{array}{r} 287 \\ 3700 \\ \hline 2009 \\ 861 \\ \hline 1061900 \end{array}$$ *Product*

2. Divide 435600 by 1800.

$$
\begin{array}{r}
242 \text{ } \textit{Quotient} \\
18\cancel{00})\overline{435\cancel{600}} \\
\underline{36} \\
75 \\
\underline{72} \\
36 \\
\underline{36}
\end{array}
$$

$1800 = 18 \times 100$.

Therefore we divide by 100 and then by 18.

How do we divide by 100?

3. Divide 83,645 by 13,000.

$$
\begin{array}{r}
6\frac{5648}{13000} \text{ } \textit{Quotient} \\
13\cancel{000})\overline{83\cancel{645}} \\
\underline{78} \\
5
\end{array}
$$

When we divide by 1000, there is a remainder of 648. When we divide by 13, there is a remainder of 5 in thousands' place. $5000 + 648 = 5648$, whole remainder.

Multiply and test by dividing the product by the multiplier:

4. 432 by 20,100

5. 69 by 38,000

6. 420 by 80,000

7. 1242 by 3020

8. 5003 by 960

9. 208 by 6500

10. 320 by 420

11. 86 by 12,000

12. 409 by 30,800

13. 6900 × 413

Divide and test results:

14. 257,830 by 590

15. 4410 by 70

16. 34,376 by 100

17. 1,333,800 by 1900

18. 1,308,580 by 260

19. 572,400 by 3600

20. 42,978 by 300

21. 642,359 by 470

22. 8,205,900 by 4200

23. 367,298 by 1600

24. 368,700 by 3600

25. 496,789 by 420

26. 805,060 by 3090

27. 367,059 by 7800

28. 8,079,600 by 71,000

29. 4,380,700 by 3210

IDEAS OF PROPORTION

Oral

FIG. A.

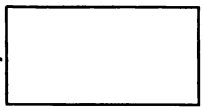
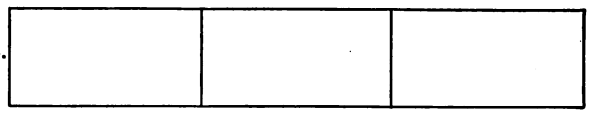


FIG. B.



1. Figure B is how many times as large as figure A?

2. If figure A is 1 inch long, how long is figure B?

3. If A and B are pieces of cloth, and A is worth $5, what is B worth?

4. If A is a piece of land containing 10 acres, what is B?

5. If A is a piece of land worth $12, what is B worth?

6. If B is worth $60, what is A worth?

7. If A and B are blocks of wood and A weighs 9 pounds, what does B weigh?

8. If B weighs 39 ounces, what does A weigh?

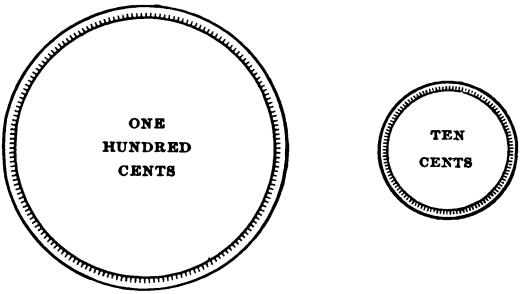
9. If A and B are fields, and A can be plowed in 4 days, how long will it take to plow B?

10. *a.* 10 pears are how many times 2 pears?

b. 2 pears are what part of 10 pears?

c. If 2 pears cost 3 cents, 10 pears cost —— cents.

d. Two pears are worth —— cents, when 10 pears are worth 25 cents.



11. *a.* One dollar is how many times one dime?

b. One dime is what part of one dollar?

c. If one dollar will buy 30 pencils, one dime will buy —— pencils.

d. If one dollar will pay for 70 apples, one dime will pay for —— apples.

e. Frank can earn one dollar in —— hours if he can earn one dime in two hours.

f. If one silver dollar weighs one ounce, one silver dime weighs —— ounce.

12. If John rides 9 miles in 2 hours, in what time can he ride 27 miles at the same rate?

Analysis: 27 miles are 3 times 9 miles. Therefore, if John rides 9 miles in two hours, he can ride 27 miles in 3 times two hours, or —— hours.

Solve and analyze each of the following problems:

13. If a man's wages for 12 hours are 5 dollars, in how many hours will he earn $20?

14. If 20 men can do a piece of work in 5 days, how long will it take 10 men to do the same?

15. When 75¢ will buy 6 pineapples, how much should be paid for 2 pineapples?

FACTORS AND MULTIPLES

One of the numbers that are multiplied to produce a number is a **factor** *of that number; e.g.* 2, 3, and 5 are factors of 30 because $2 \times 3 \times 5 = 30$.

A number that exactly contains another number is a **multiple** *of that number; e.g.* 21 is a multiple of 7. It is also a multiple of 3.

A number that is composed entirely of whole units is an **integer**; *e.g.* 7, 13, 200. Can you name a number that is not an integer?

A factor that is an integer is called an **integral factor**; *e.g.* 8 is an integral factor of 56.

A number that is not the product of integral factors other than itself and 1 *is a* **prime number**; *e.g.* 2, 3, 5, 7, 11, and 13.

A number that is the product of integral factors other than itself and 1 *is a* **composite number**; *e.g.* 16, 24, 35, 1000.

A factor that is a prime number is a **prime factor**; *e.g.* 13 is a prime factor of 26.

A number that is exactly divisible by 2 *is an* **even number**; *e.g.* 2, 4, 6, 8, 10.

A number that is not exactly divisible by 2 *is an* **odd number**; *e.g.* 1, 3, 5, 7, 11.

NOTE. — In finding the factors of a number it is customary to consider only integral factors.

Oral

1. Give the factors of 21; 35; 49; 77; 26; 39; 34; 15; 91.
2. Name three factors of 30.
3. Name as many factors of 24 as you can.

4. Of what numbers are 7, 2, and 13 the prime factors?

5. Name four multiples of 9.

6. 132 is the product of 12 and what other factor?

7. Name all the prime numbers smaller than 50.

8. 84 is the product of three factors. Two of them are 2 and 6. What is the other?

9. Of what number are 2, 3, 5, and 7 the prime factors?

10. Give the prime factors of 15; 25; 21; 33; 77; 30; 42; 51.

11. 5, 2, and what other number are the prime factors of 70?

12. Give two factors of 30 that are not prime.

13. What even number is prime?

Rule for finding whether a Number is Prime or Composite.

1. *If the given number is odd, divide it by* 3.

2. *If* 3 *gives a remainder, divide the given number by* 5.

3. *Continue this process, using each prime number in order as a divisor, until an exact divisor is found, or until the divisor equals or exceeds the quotient. If no exact divisor is found until the divisor used equals or exceeds the quotient, the number is prime. Otherwise it is composite.*

e.g. To find whether 71 is prime or composite,

3)71 — 23 — 2 rem. 5)71 — 14 — 1 rem. 7)71 — 10 — 1 rem. 11)71 — 6 — 5 rem.

Since the divisor 11, is greater than the quotient 6, and no exact divisor has been found, 71 must be prime.

Even numbers need not be tested; for no even number, except 2, is prime. Why?

In finding the factors of a number, it is useful to remember that

a. A number is divisible by 2 if the figure in units' place is even.

b. A number is divisible by 5 if the figure in units' place is 0 or 5.

Find whether each of these numbers is prime or composite:

1. 143	5. 211	9. 121	13. 231	17. 437
2. 123	6. 221	10. 97	14. 161	18. 401
3. 324	7. 119	11. 213	15. 87	19. 593
4. 163	8. 208	12. 215	16. 78	20. 395

Written

1. Find the prime factors of 7020.

2 | 7020	
2 | 3510	
3 | 1755	By what kind of numbers do we divide? **Why?**
3 | 585	Which divisors do we use first?
3 | 195	What besides the divisors is a prime factor?
5 | 65	
13	

$2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 5 \cdot 13$ Prime factors, *Ans.*

Find the prime factors of:

2. 120	8. 45	14. 3381	20. 169
3. 42	9. 189	15. 667	21. 561
4. 66	10. 665	16. 310	22. 1001
5. 110	11. 429	17. 399	23. 1265
6. 105	12. 425	18. 1287	24. 682
7. 462	13. 414	19. 253	25. 729

CANCELLATION

1. *Taking a factor out of a number* **divides** *the number by the* **factor taken out**, thus:

$$210 = 2 \times 3 \times 5 \times 7$$
$$2 \times 3 \times 5 = 30 \qquad \frac{210}{7} = 30$$

2. $2730 = 2 \times 2 \times 7 \times 13 \times 5 \qquad 65 = 5 \times 13$

$$\frac{2730}{65} = \frac{2 \times 3 \times 7 \times \cancel{13} \times \cancel{5}}{\cancel{5} \times \cancel{13}} = 2 \times 3 \times 7 = 42 \quad \textit{Quotient}$$

3. *Taking the same factor from both dividend and divisor is* **cancellation.** In example 2 what factors were taken from both dividend and divisor?

4. *Find the quotients by cancellation:*

a. $\dfrac{2 \times 5 \times 11 \times 13}{5 \times 13}$ *b.* $\dfrac{3 \times 17 \times 19 \times 2}{3 \times 19}$

c. $\dfrac{4 \times 8 \times 9 \times 11 \times 14}{14 \times 9 \times 8}$ *d.* $\dfrac{3 \times 8 \times 12 \times 13 \times 15}{15 \times 8 \times 13}$

e. $\dfrac{21 \times 7 \times 3 \times 5 \times 6}{7 \times 6 \times 21}$ *f.* $\dfrac{4 \times 31 \times 50 \times 6 \times 9}{50 \times 6 \times 4}$

g. $\dfrac{12 \times 16 \times 3 \times 45 \times 19}{19 \times 3 \times 12}$ *h.* $\dfrac{8 \times 17 \times 5 \times 6 \times 7}{5 \times 8 \times 7}$

5. $\dfrac{2310}{33} = \dfrac{2 \times \cancel{3} \times 5 \times 7 \times \cancel{11}}{\cancel{3} \times \cancel{11}} = 2 \times 5 \times 7 = 70 \quad \textit{Quotient}$

6. $\dfrac{\overset{6}{\cancel{12}} \times \cancel{9} \times \overset{7}{\cancel{49}} \times \overset{5}{\cancel{25}}}{7 \times \underset{\cancel{9}}{\cancel{18}} \times \cancel{5}} = 210$

We take the factor 2 out of 12 and 18; the factor 7 out of 7 and 49; the factor 5 out of 5 and 25; and cancel the factor 9 from both dividend and divisor. The factors remaining in the dividend are 6, 7, and 5. $6 \times 7 \times 5 = 210$ *Quotient.*

7. $\frac{\cancel{231}}{\cancel{33}} = 7$ *Quotient* — We take the factors 3 and 11 out of both dividend and divisor.

8. $\frac{\cancel{25} \times \cancel{2} \times \cancel{72} \times 14}{\cancel{6} \times 9 \times \cancel{120}} = \frac{70}{9} = 7\frac{7}{9}$ *Quotient* — We take the factor 12 out of 72 and 120, then the factor 5 out of 25 and 10.

9. $\frac{36 \times 27 \times 49 \times 50}{70 \times 18 \times 15} = ?$

10. $\frac{7 \times 4 \times 24 \times 2}{2 \times 7 \times 12 \times 2} = ?$

11. $(2 \times 5 \times 54) \div (10 \times 6) = \frac{2 \times 5 \times 54}{10 \times 6} = ?$

12. $(36 \times 48 \times 16) \div (27 \times 24 \times 8) = ?$

13. Divide $25 \times 2 \times 72 \times 14$ by $6 \times 9 \times 120$.

14. $(11 \times 3 \times 15 \times 14) \div (21 \times 11 \times 3) = ?$

15. $\frac{4 \times 6 \times 10 \times 20}{12 \times 25} = ?$

16. $\frac{8 \times 14 \times 22 \times 18}{2 \times 11 \times 7 \times 3} = ?$

17. What is the quotient of $4 \times 9 \times 17 \times 80$ divided by 17×90?

18. $(16 \times 24 \times 33 \times 34) \div (11 \times 4 \times 8 \times 17) = ?$

19. Divide $36 \times 27 \times 49 \times 38 \times 50$ by $70 \times 18 \times 15$.

20. $(28 \times 38 \times 48) \div (14 \times 19 \times 24 \times 2 \times 2) = ?$

21. $(26 \times 5 \times 54) \div (13 \times 5 \times 6) = ?$

22. What is the quotient of $36 \times 48 \times 16$ divided by $27 \times 24 \times 8$?

23. Divide $5 \times 45 \times 7 \times 20$ by $49 \times 5 \times 4 + 9$.

24. Divide $5 \times 51 \times 7 \times 9 \times 4$ by $17 \times 20 \times 12 \times 7 \times 2$.

25. Divide $25 \times 2 \times 72 \times 14$ by $6 \times 9 \times 120$.

1. How many pineapples at 8 cents apiece will pay for 10 hours' work at 12 cents an hour?

The work is worth (12×10) cents.
One pineapple is worth 8 cents.

(12×10) cents will buy $\frac{12 \times 10}{8}$ pineapples.

$$\frac{\overset{3}{\cancel{12}} \times \overset{5}{\cancel{10}}}{\underset{2}{\cancel{8}}} = 15 \text{ pineapples } \textit{Answer.}$$

2. A farmer exchanged 45 cabbages at 9 cents apiece for sugar at 5 cents a pound. How many pounds did he receive?

3. A milkman sold 280 quarts of milk at 6 cents a quart and bought corn at 70 cents a bushel. The milk paid for how many bushels of corn?

4. William traded 6 bushels of hickory nuts at 96 cents a bushel for hens at 48 cents apiece. How many hens did he get?

5. A college student worked 72 days in vacation at $3 a day. If all his expenses in college amounted to $2 a day, how long did his money last?

6. How many bricks 8 inches long and 4 inches wide are required to cover a hearth 64 inches long and 32 inches wide? (Picture.)

7. How many baskets of peaches, each containing 10 quarts worth 6 cents a quart, must be given for 18 bushels of sweet potatoes at 60 cents a bushel?

8. How many bushels of potatoes at 50 cents a bushel must be given in exchange for 15 pounds of tea at 40 cents a pound?

REVIEW AND PRACTICE

Oral

1. Name the letters used in Roman notation and give the value of each.

In finding the sums and differences below, add or subtract the tens' figures first, thus:

$36 + 46 = ?$	$93 - 27 = ?$
$36 + 40 = 76$	$93 - 20 = 73$
$76 + 6 = 82$ *Ans.*	$73 - 7 = 66$ *Ans.*
Say 36, 76, 82.	Say 93, 73, 66.

2. *Find the sums:*

$36 + 47$	$89 + 27$	$82 + 69$	$78 + 36$
$81 + 29$	$62 + 38$	$38 + 78$	$29 + 92$
$76 + 39$	$48 + 24$	$29 + 33$	$26 + 35$
$48 + 53$	$36 + 17$	$42 + 71$	$42 + 99$

3. *Find the differences:*

$28 - 19$	$41 - 14$	$31 - 14$	$45 - 36$
$31 - 13$	$62 - 28$	$75 - 37$	$109 - 87$
$43 - 16$	$97 - 58$	$62 - 19$	$203 - 174$
$81 - 45$	$76 - 59$	$58 - 29$	$311 - 82$

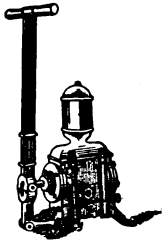
4. *Give products at sight:*

403×10 $\quad 86 \times 100$ $\quad 86 \times 200$ $\quad 15 \times 40$ $\quad 19 \times 40$

5. Henry can row a boat 20 rods in a minute, and Eva can row 15 rods in a minute. If Eva is 60 rods ahead of Henry, in how many minutes can he overtake her?

6. *a.* How many strokes of a force pump are required to fill $\frac{1}{8}$ of a tank that holds 200 gallons of water, if a pint is pumped at each stroke?

b. How long would it take at 20 strokes per minute?



A Force Pump

Written

1. *Find sums and test your work.* Can you do it in four minutes? Do not copy addends.

a.	*b.*	*c.*	*d.*
49	235	8749	$346.25
392	419	3254	29.48
48	786	286	934.29
6759	592	39	98.65
24	839	458	813.78
864	496	3476	92.48
9837	318	239	9.62
481	745	8375	46.78
28	932	468	932.86
938	467	9628	48.93

2. *Subtract and test:*

a.	*b.*	*c.*	*d.*
4352	38290	4001	603040
1987	8199	102	13048

3. *Divide and test:*

a. 153825 by 25. *b.* 49386 by 78. *c.* 12634 by 500.
d. 983,700 by 1500. *e.* 863,426 by 19,000. *f.* 163,801 by 690.

4. 2, 3, 5, 7, 11, 13, and 17 are the prime factors of what number?

5. 8987 has what prime factor beside 19 and 11?

6. *Indicate the work and solve:*

a. Divide by 37 the result obtained by adding 111 to the product of 148 and 6090.

b. A merchant bought 345 pounds of wool of one man, 3067 pounds of another, 468 pounds of another, and 384 pounds of another; he sold $\frac{1}{2}$ of it at 27 cents a pound. What did he receive for the part sold?

LEAST COMMON MULTIPLE

Oral

1. $3 \times 4 = ?$ 12 is what of 3? Of 4?
2. $2 \times 6 = ?$ 12 is what of 2? Of 6?
3. Name all the numbers of which 12 is a multiple.
4. Define multiple.

A number that exactly contains two or more numbers is a **common multiple** *of those numbers; e.g.* 12 is a common multiple of 2, 3, 4, and 6. 36 is also a common multiple of 2, 3, 4, and 6.

Can you name any other common multiple of 2, 3, 4, and 6?

The smallest number that exactly contains two or more numbers is their **least common multiple** (L. C. M.); *e.g.* 18 is the least common multiple of 3, 6, and 9. 36 is a common multiple of 3, 6, and 9. Why is it not the least common multiple?

Find the L. C. M. of:

1. 2 and 3
2. 2, 3, and 4
3. 4 and 6
4. 5, 4, and 2
5. 7, 4, and 2
6. 10, 5, and 4

When the least common multiple is a large number, the following direct method is employed in finding it.

Let it be required to find the L. C. M. of 12, 15, and 18.

$$12 = 2 \times 2 \times 3$$
$$15 = 3 \times 5$$
$$18 = 2 \times 3 \times 3$$

What kind of factors have we found? A number, in order to contain 12, must have what prime factors? What prime factors must it have in order to contain 15? 18? A number that contains 12, 15, and 18 must have how many factors 2? How many factors 3? How many factors 5?

What is the smallest number that has the factors 2, 2, 3, 3, and 5? What, then, is the L. C. M. of 12, 15, and 18?

The prime factors may be found easily in this way:

2	12	15	18
3	6	15	9
	2	5	3

By what kind of numbers do we divide?

$2 \times 3 \times 2 \times 5 \times 3 = 180$ L. C. M.

Find the L. C. M.:

1. 18, 27, 30
2. 9, 12, 18
3. 16, 48, 60
4. 21, 27, 36
5. 36, 40, 48
6. 18, 24, 36
7. 15, 30, 21, 28
8. 15, 60, 140, 210
9. 24, 42, 54, 360
10. 25, 20, 35, 40
11. 14, 21, 35, 45
12. 24, 48, 96, 192
13. 15, 18, 20, 60
14. 16, 24, 40
15. 10, 15, 6, 14,
16. 48, 20, 21
17. 9, 36, 45, 63, 42
18. 25, 15, 30, 50
19. 13, 19
20. 2, 3, 4, 5, 6
21. 7, 8, 9, 10

GREATEST COMMON DIVISOR

A number that will exactly divide two or more numbers is a **common divisor** *of those numbers; e.g.* 5 is a common divisor of 30, 40, and 60.

The largest number that will exactly divide two or more numbers is their **greatest common divisor** (G. C. D.); *e.g.* 10 is the greatest common divisor of 30, 40, and 60.

NOTE. — A common divisor is sometimes called a *common factor*, and the greatest common divisor is sometimes called the *highest common factor.*

Numbers that have no common divisor are **prime to each other**; *e.g.* 13 and 15.

Oral

1. *Find the G. C. D of:*

a. 6, 9, 12
b. 10, 30, 35
c. 2, 10, 16
d. 8, 24, 40
e. 14, 28, 42
f. 33, 22, 77
g. 30, 45, 60
h. 18, 27, 36
i. 12, 24, 36, 48

2. Name two numbers of which 7 is a common divisor.

3. Name three numbers of which 9 is a common divisor.

4. Name two numbers which are prime to each other.

Written

1. Find the greatest common divisor of 336, 504, and 924.

$$336 = \not{2} \times \not{2} \times 2 \times 2 \times \not{3} \times \quad \not{7}$$
$$504 = \not{2} \times \not{2} \times 2 \quad \times \not{3} \times 3 \times \not{7}$$
$$924 = \not{2} \times \not{2} \quad \times \not{3} \quad \times \not{7} \times 11$$

$2 \times 2 \times 3 \times 7 = 84$ G. C. D.

Factoring the numbers and selecting the common prime factors, we find them to be 2, 2, 3, and 7 Since all of them are factors of each of the given numbers, their product, 84, is the greatest common divisor required.

The common prime factors may easily be found in this way:

2	336	504	924
2	168	252	462
3	84	126	231
7	28	42	77
	4	6	11

2 · 2 · 3 · 7 Common prime factors.

Find the G. C. D.:

2. 63, 42
3. 90, 105
4. 112, 168
5. 132, 156
6. 40, 60, 80
7. 64, 144, 560
8. 36, 48, 24
9. 40, 56, 72
10. 18, 54, 32
11. 45, 60, 90
12. 36, 72, 81
13. 44, 121, 33
14. 63, 126, 189
15. 36, 81, 135
16. 91, 143, 156
17. 192, 400, 240
18. 168, 210, 308, 350
19. 1980, 945

20. Find all the common prime factors of 360, 540, and 450.

21. Find the product of all the common prime factors of 108, 144, and 360.

22. Find a number that is prime to 210.

REVIEW OF INTEGERS

Oral

1. $(15-4)\times(3+2)=?$

2. $15-4\times3+2=?$

3. Numerate 137,640,507,239.

4. Name the periods in the above number.

5. Read DCXLIV.

6. What is the value of $\frac{2}{4}\frac{3}{6}$?

7. $35+48=?$ $(35+40=75;\ 75+8=83.$ Say 35, 75, 83.)

In the same way add:

a. 63 and 29; *b.* 58 and 15; *c.* 49 and 33; *d.* 67 and 24.

8. The product of two factors is 45. If one factor is 9, what is the other? If one factor is 15, what is the other? If one factor is 6, what is the other?

Which of the factors given in your answer is not an integral factor?

9. The product of three factors is 108. Two of them are 4 and 3. What is the other?

10. Find the difference by subtracting the tens first:

a. $64-25$; *b.* $81-32$; *c.* $\$.76-\$.28$; *d.* $\$1.27-\$.79$.

11. $24\times20=?$ $30{,}700\div100=?$ $1200\div200=?$

12. $235\times1000=?$ $208\times10=?$ $4000\div400=?$

13. $1{,}500{,}000\div1500=?$

14. Edward earned \$3 one week and \$6 the next. How much was left after he had spent $\frac{2}{3}$ of it?

15. What part of \$5 is $\$2\frac{1}{2}$? If \$5 will buy 20 splint baskets, how many such baskets will $\$2\frac{1}{2}$ buy?

16. The change for \$.24 from \$1.00 is \$.06 + \$.70 = \$.76. Say 6, 76.

Find the change from \$1.00 for:

a. \$.28 *c.* \$.18 *e.* \$.69 *g.* \$.52 *i.* \$.79 *k.* \$.72
b. \$.10 *d.* \$.42 *f.* \$.37 *h.* \$.39 *j.* \$.83 *l.* \$.35

17. *a.* One day is what part of a week? If a man pays \$84 for a week's travelling expenses, they average how much per day? *b.* At the same rate, what would they be for 11 days?

18. How many times is \$20 contained in \$400?

19. What part of \$400 is \$20?

20. A cent is what part of a dime? 7 cents are what part of a dime?

21. If a dime will pay for 20 steel hooks, how many such hooks will 7 cents buy?

22. 6 is what part of 12?

23. When a hardware merchant makes a profit of \$1.44 on 12 window screens, what does he make on 6 of them?

24. What is the greatest number that will exactly divide 12, 30, and 36?

25. Name two numbers of which 11 is the G. C. D.

26. Tell which of these pairs of numbers are prime to each other:

a. 12 and 7 *b.* 16 and 20 *c.* 19 and 21 *d.* 8 and 15

27. Find the greatest number that will exactly divide 189, 378, and 504.

28. *Find results:*

27,000 + 13,000	345,000 ÷ 100	8324 ÷ 100
218 − 38	6250 ÷ 10	2800 ÷ 400
550 × 100	435 ÷ 10	1635 ÷ 200

Written

Test and time yourself on the first eight examples.

1. Add:

287
965
473
287
69
218
246
968
749
421
372
568

2. Add:

627
438
796
342
109
781
627
280
3578
642
7986
8144

3. Subtract:

807,204
99,197

4. Subtract:

230,007
150,000

5. 2059×78

6. $786 \times 205 \div 210$

7. $302 \times (4780 - 3874)$

8. $346793 \div 5700$

9. A park in the shape of a rectangle, 135 rods long and 48 rods wide, contains how many square rods of land? How many acres?

10. A farmer has 20 cows and feeds each of them two quarts of corn meal a day. How long will 100 bushels of corn meal last them? (Solve by cancellation.)

11. A man owed his grocer \$135. He paid $\frac{2}{3}$ of the debt in labor and the rest in cash. *a.* How much cash did he pay? *b.* How many days did he work, if he received \$2 a day?

12. In the year 1905, 1,027,421 immigrants came to this country; 317,000 of them settled in New York State, 222,300 in Pennsylvania, 20,000 west of the Mississippi River, and the rest in other parts of the country. *a.* How many settled in other parts of the country? *b.* The entire number was how many times the number that settled west of the Mississippi?

FRACTIONS

Review pages 142–170

One or more of the equal parts of a unit is a **fraction**; *e.g.* $\frac{1}{8}$; $\frac{3}{5}$; $\frac{2}{7}$; \$$\frac{5}{10}$.

A fraction is always an expression of **division.** For example, if 1 inch is divided into 8 equal parts, each part is $\frac{1}{8}$ of an inch. If a line 7 inches long is divided into 8 equal parts, one part is $\frac{7}{8}$ of an inch long. That is, 1 inch $\div$ 8 = $\frac{1}{8}$ inch, and 7 inches $\div$ 8 = $\frac{7}{8}$ inch.

Take your rule and draw a line 1 inch long. Divide it into 4 equal parts. How long is one part? Draw a line 3 inches long. Divide it into 4 equal parts. Measure one of the parts. 3 inches $\div$ 4 = ?

Draw a line 5 inches long. Divide it into 8 equal parts. Measure one of the parts. 5 inches $\div$ 8 = ? 3 $\div$ 7 = ? 9 $\div$ 11 = ?

The number above the line in a fraction is the **numerator.** *It is always a* **dividend.** In the fractions $\frac{1}{3}$, $\frac{7}{9}$, $\frac{15}{5}$, $\frac{23}{12}$, the numerators are 1, 7, 15, and 23.

The number below the line in a fraction is the **denominator.** *It is always a* **divisor.** In the fractions $\frac{1}{3}$, $\frac{7}{9}$, $\frac{15}{5}$, $\frac{23}{12}$, the denominators are 3, 9, 5, and 12.

The numerator and denominator are the **terms of a fraction**; *e.g.* the terms of $\frac{7}{11}$ are 7 and 11.

The **value of a fraction** *is the quotient obtained by dividing the numerator by the denominator.*

REDUCTION OF FRACTIONS

Changing the form of a number without changing its value is **reduction**; *e.g.* 8 pt. = 4 qt.; \$7 = 700 ct.; 7 ft. = $2\frac{1}{3}$ yd.; $\frac{12}{4} = 3$; $\frac{18}{24} = \frac{3}{4}$; $\frac{2}{5} = \frac{6}{15}$.

REDUCTION TO LOWEST TERMS

A fraction is in its **lowest terms** *when the numerator and denominator are prime to each other; e.g.* $\frac{5}{7}$, $\frac{8}{11}$, $\frac{19}{20}$.

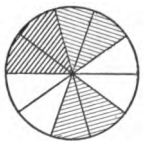
Oral

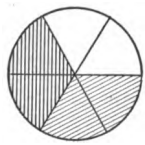
1. Dividing both dividend and divisor by the same number affects the quotient how?

2. $\frac{48}{20}$ compares how with $\frac{12}{5}$?

3. $\frac{6}{21}$ compares how with $\frac{2}{7}$? What did we do with the terms of $\frac{6}{21}$ to obtain $\frac{2}{7}$?

4. Show by these circles that





$\frac{2}{6} = \frac{1}{3}$. $\frac{4}{6} = \frac{2}{3}$.

$\frac{2}{10} = \frac{1}{5}$. $\frac{4}{10} = \frac{2}{5}$.

$\frac{6}{10} = \frac{3}{5}$. $\frac{8}{10} = \frac{4}{5}$.

$\frac{5}{10} = \frac{1}{2}$.

5. How are these fractions reduced to lowest terms?

6. Reduce to lowest terms: $\frac{2}{4}$; $\frac{3}{6}$; $\frac{6}{8}$; $\frac{3}{9}$; $\frac{2}{6}$; $\frac{5}{10}$; $\frac{4}{8}$; $\frac{6}{9}$; $\frac{9}{12}$; $\frac{2}{8}$; $\frac{2}{10}$; $\frac{7}{14}$; $\frac{3}{12}$; $\frac{5}{15}$; $\frac{6}{12}$; $\frac{9}{18}$; $\frac{4}{12}$; $\frac{2}{14}$; $\frac{14}{18}$; $\frac{15}{20}$; $\frac{16}{24}$; $\frac{12}{15}$; $\frac{18}{24}$; $\frac{8}{10}$; $\frac{10}{12}$; $\frac{8}{12}$, $\frac{8}{14}$.

Written

Reduce $\frac{42}{48}$ to lowest terms. $\frac{42}{48} = \frac{21}{24} = \frac{7}{8}$ *Ans.* We divide both terms by 2 and then by 3.

If we use the greatest common divisor (6), we shall need to divide only once, thus $\frac{42}{48} = \frac{7}{8}$.

NOTE. — We may often save time by remembering that an even number will never exactly divide an odd number. Can you tell why?

Reduce to lowest terms:

1. $\frac{36}{54}$	8. $\frac{72}{128}$	15. $\frac{112}{1888}$	22. $\frac{647}{1294}$
2. $\frac{72}{108}$	9. $\frac{214}{316}$	16. $\frac{121}{154}$	23. $\frac{441}{945}$
3. $\frac{27}{81}$	10. $\frac{75}{225}$	17. $\frac{130}{260}$	24. $\frac{87}{878}$
4. $\frac{45}{95}$	11. $\frac{80}{286}$	18. $\frac{77}{165}$	25. $\frac{83}{581}$
5. $\frac{88}{86}$	12. $\frac{124}{224}$	19. $\frac{96}{544}$	26. $\frac{198}{612}$
6. $\frac{55}{99}$	13. $\frac{470}{2350}$	20. $\frac{114}{285}$	27. $\frac{105}{525}$
7. $\frac{60}{360}$	14. $\frac{150}{6000}$	21. $\frac{384}{1152}$	28. $\frac{121}{143}$

29. Express in lowest terms 230 ÷ 345.

30. Express in lowest terms 98 divided by 392.

31. Express in lowest terms 437 ÷ 2484.

32. Express in lowest terms the quotient of 288 divided by 504.

33. What are the lowest terms of $\frac{138}{153}$?

REDUCTION OF IMPROPER FRACTIONS TO INTEGERS OR MIXED NUMBERS

A fraction whose numerator is smaller than its denominator is a **proper fraction**; *e.g.* $\frac{2}{9}$, $\frac{1}{15}$, $\frac{16}{17}$. The value of a proper fraction is always less than 1.

A fraction whose numerator equals or exceeds its denominator is an **improper fraction**, *e.g.* $\frac{5}{5}$, $\frac{9}{8}$, $\frac{24}{12}$. The value of an improper fraction compares how with 1?

A number that is composed of an integer and a fraction is **a mixed number**; *e.g.* $5\frac{3}{7}$, $10\frac{1}{3}$, $201\frac{6}{11}$.

Oral

1. A boy has two half dollars. That is the same as how many whole dollars? Six half dollars equal how many whole dollars? How do you find it?

2. Eleven half dollars make how many dollars and how many halves over? How do you find it? Write it.

3. How many quarters make a dollar?

4. How many dollars are there in 8 quarters? 40 quarters?

5. Fifteen quarters make how many dollars and how many quarters over? Write it. What do you do to find it?

6. $\frac{2}{2}$ = how many whole ones? $\frac{8}{2}$? $\frac{16}{2}$? $\frac{9}{2}$?

7. $\frac{4}{4} = ?$ $\frac{8}{4} = ?$ $\frac{12}{4} = ?$ $\frac{14}{4} = ?$

8. A fraction is an expression of what operation?

9. How may we find the value of a fraction?

10. Define the value of a fraction.

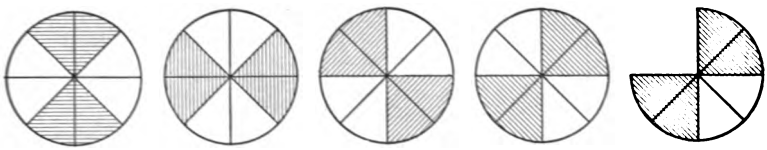
Find the values of:

11. $\frac{4}{2}$	15. $\frac{10}{4}$	19. $\frac{25}{6}$	23. $\frac{73}{7}$	27. $\frac{245}{5}$	31. $\frac{42}{13}$
12. $\frac{5}{4}$	16. $\frac{7}{3}$	20. $\frac{39}{7}$	24. $\frac{80}{11}$	28. $\frac{77}{12}$	32. $\frac{63}{15}$
13. $\frac{6}{3}$	17. $\frac{13}{3}$	21. $\frac{40}{8}$	25. $\frac{91}{9}$	29. $\frac{46}{11}$	33. $\frac{56}{15}$
14. $\frac{7}{2}$	18. $\frac{17}{4}$	22. $\frac{51}{3}$	26. $\frac{124}{2}$	30. $\frac{74}{12}$	34. $\frac{111}{11}$

Written

1. $\frac{191}{4}$	3. $\frac{292}{14}$	5. $\frac{967}{32}$	7. $\frac{1216}{20}$	9. $\frac{930}{57}$
2. $\frac{376}{25}$	4. $\frac{817}{27}$	6. $\frac{785}{37}$	8. $\frac{989}{45}$	10. $\frac{3900}{29}$
11. $\frac{943}{18}$	14. $\frac{9603}{39}$	17. $\frac{893}{46}$	20. $\frac{4973}{67}$	
12. $\frac{3467}{14}$	15. $\frac{979}{37}$	18. $\frac{912}{89}$	21. $\frac{7234}{79}$	
13. $\frac{879}{37}$	16. $\frac{348}{18}$	19. $\frac{3522}{171}$	22. $\frac{28501}{104}$	

REDUCTION OF INTEGERS AND MIXED NUMBERS TO IMPROPER FRACTIONS



Oral

1. How many fourths in 1 circle? In 2 circles? In 3 circles? In 4 circles?

2. How many fourths in $4\frac{3}{4}$ circles? In $2\frac{3}{4}$ circles? In $3\frac{1}{4}$ circles?

3. How many eighths in 1 circle? In 3 circles? In 2 circles? In $4\frac{6}{8}$ circles? In $2\frac{3}{8}$ circles?

4. How do you reduce an integer or a mixed number to a fraction?

Reduce to improper fractions:

5. $1\frac{1}{3}$	9. $3\frac{4}{5}$	13. $3\frac{4}{7}$	17. $8\frac{1}{9}$
6. $4\frac{1}{2}$	10. $2\frac{3}{4}$	14. $4\frac{7}{9}$	18. $7\frac{5}{11}$
7. $3\frac{3}{8}$	11. $4\frac{3}{5}$	15. $5\frac{3}{5}$	19. $8\frac{9}{10}$
8. $5\frac{1}{4}$	12. $2\frac{5}{6}$	16. $6\frac{3}{7}$	20. $9\frac{1}{6}$

Written

1. Reduce $38\frac{7}{9}$ to a fraction.

$38 = 38 \times 9$ ninths $= 342$ ninths.

342 ninths plus 7 ninths $= 349$ ninths.

The work may be expressed thus: $38\frac{7}{9} = \frac{342}{9}$ *Ans.*

$$\begin{array}{r} 9 \\ \hline 342 \\ 7 \\ \hline 349 \end{array}$$

Reduce to fractions:

2. $9\frac{3}{14}$	9. $49\frac{7}{15}$	16. $19\frac{7}{12}$	23. $35\frac{1}{31}$
3. $17\frac{1}{9}$	10. $25\frac{1}{80}$	17. $29\frac{4}{11}$	24. $191\frac{5}{12}$
4. $25\frac{6}{7}$	11. $59\frac{3}{14}$	18. $149\frac{6}{7}$	25. $203\frac{8}{19}$
5. $15\frac{5}{11}$	12. $67\frac{5}{16}$	19. $128\frac{4}{5}$	26. $98\frac{11}{18}$
6. $23\frac{2}{15}$	13. $89\frac{20}{29}$	20. $137\frac{7}{18}$	27. $87\frac{17}{19}$
7. $40\frac{7}{9}$	14. $131\frac{7}{9}$	21. $238\frac{11}{48}$	28. $138\frac{20}{129}$
8. $37\frac{4}{13}$	15. $270\frac{23}{85}$	22. $491\frac{7}{45}$	29. $351\frac{18}{17}$

LEAST COMMON DENOMINATOR

Fractions whose denominators are alike have a **common denominator**; *e.g.* 60 is a common denominator of $\frac{3}{60}$, $\frac{18}{60}$, and $\frac{27}{60}$.

Fractions having the smallest possible common denominator have their **least common denominator**; *e.g.* $\frac{1}{20}$, $\frac{6}{20}$, $\frac{9}{20}$.

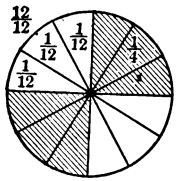
Oral

1. We have found that when we add fractions having different denominators, we must first change them to fractions having the same denominator. What shall we call that denominator?

2. Since the common denominator must contain all the given denominators, it must be what of those denominators? (A number that exactly contains two or more other numbers is what?)

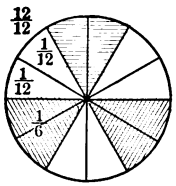
3. The least common denominator, then, must be which multiple of the given denominators?

4. Reduce $\frac{3}{4}$, $\frac{5}{6}$, and $\frac{2}{3}$ to fractions having the least common denominator.



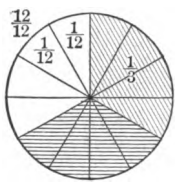
How many 12ths in $\frac{1}{4}$? $(12 \div 4 = 3.)$

How many 12ths in $\frac{3}{4}$? $\left(\frac{3 \times 3}{4 \times 3} = \frac{9}{12}.\right)$



How many 12ths in $\frac{1}{6}$? $(12 \div 6 = 2.)$

How many 12ths in $\frac{5}{6}$? $\left(\frac{5 \times 2}{6 \times 2} = \frac{10}{12}.\right)$



How many 12ths in $\frac{1}{3}$? $(12 \div 3 = 4.)$

How many 12ths in $\frac{2}{3}$? $\left(\frac{2 \times 4}{3 \times 4} = \frac{8}{12}.\right)$

Change the following to fractions having the least common denominator:

5. $\frac{1}{2}, \frac{3}{4}$
6. $\frac{2}{3}, \frac{5}{6}$
7. $\frac{1}{2}, \frac{7}{9}$
8. $\frac{5}{7}, \frac{1}{14}, \frac{1}{2}$
9. $\frac{1}{5}, \frac{1}{3}, \frac{7}{15}$
10. $\frac{1}{2}, \frac{2}{7}, \frac{1}{21}$
11. $\frac{2}{3}, \frac{5}{9}, \frac{7}{18}$
12. $\frac{5}{6}, \frac{3}{4}, \frac{2}{3}$
13. $\frac{6}{5}, \frac{5}{6}, \frac{1}{2}$
14. $\frac{7}{9}, \frac{2}{3}, \frac{3}{2}$
15. $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{12}$
16. $\frac{1}{3}, \frac{2}{5}, \frac{2}{3}, \frac{7}{15}$
17. $\frac{5}{24}, \frac{1}{8}, \frac{1}{3}$
18. $\frac{3}{8}, \frac{7}{12}, \frac{5}{6}$
19. $\frac{5}{9}, \frac{1}{2}, \frac{1}{6}$
20. $\frac{7}{8}, \frac{2}{3}, \frac{5}{12}$
21. $\frac{5}{7}, \frac{2}{3}, \frac{11}{21}$
22. $\frac{1}{2}, \frac{7}{15}, \frac{3}{10}$
23. $\frac{7}{9}, \frac{5}{6}, \frac{1}{2}, \frac{1}{3}$
24. $\frac{1}{4}, \frac{2}{3}, \frac{11}{12}, \frac{7}{8}$
25. $\frac{1}{7}, \frac{1}{14}, \frac{1}{4}, \frac{1}{2}$
26. $\frac{5}{7}, \frac{3}{14}, \frac{3}{4}, \frac{19}{28}$
27. $\frac{1}{7}, \frac{1}{8}, \frac{1}{4}, \frac{1}{2}$
28. $\frac{3}{7}, \frac{5}{8}, \frac{3}{4}, \frac{1}{28}$
29. $\frac{1}{9}, \frac{1}{6}, \frac{1}{4}, \frac{1}{3}, \frac{1}{12}$
30. $\frac{7}{9}, \frac{2}{3}, \frac{5}{6}, \frac{7}{12}, \frac{1}{18}$
31. $\frac{3}{4}, \frac{7}{8}, \frac{12}{16}, \frac{19}{32}, \frac{1}{2}$

Written

Change $\frac{7}{10}$, $\frac{8}{15}$, $\frac{16}{33}$ and $\frac{17}{30}$ to fractions having the least common denominator.

	7	8	16	17
2	10	15	33	30
3	5	15	33	15
5	5	5	11	5
	1	1	11	1

$2 \times 3 \times 5 \times 11 = 330$ L. C. M.

$330 \div 10 = 33$ $\quad \frac{7 \times 33}{10 \times 33} = \frac{231}{330}$

$330 \div 15 = 22$ $\quad \frac{8 \times 22}{15 \times 22} = \frac{176}{330}$

$330 \div 33 = 10$ $\quad \frac{16 \times 10}{33 \times 10} = \frac{160}{330}$

$330 \div 30 = 11$ $\quad \frac{17 \times 11}{30 \times 11} = \frac{187}{330}$

$\frac{231}{330}, \frac{176}{330}, \frac{160}{330}, \frac{187}{330}$ *Ans.*

Change to fractions having the least common denominator:

1. $\frac{1}{4}, \frac{3}{5}, \frac{5}{6}$
2. $\frac{2}{3}, \frac{4}{5}, \frac{4}{9}$
3. $\frac{5}{8}, \frac{9}{10}, \frac{1}{2}$
4. $\frac{5}{7}, \frac{12}{18}$
5. $\frac{3}{7}, \frac{5}{12}, \frac{18}{28}$
6. $\frac{1}{4}, \frac{3}{5}, \frac{5}{6}, \frac{7}{8}$
7. $9, \frac{5}{8}, \frac{9}{10}, \frac{4}{5}$
8. $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{12}$
9. $\frac{3}{4}, \frac{3}{5}, \frac{4}{5}, \frac{9}{10}$
10. $\frac{5}{8}, \frac{7}{10}, \frac{3}{4}, \frac{4}{5}$
11. $\frac{14}{35}, \frac{5}{91}, \frac{27}{65}$
12. $\frac{2}{5}, \frac{3}{8}, \frac{1}{4}, \frac{11}{12}$
13. $\frac{15}{34}, \frac{5}{12}, \frac{3}{17}$
14. $\frac{21}{26}, \frac{7}{18}, \frac{5}{13}$
15. $\frac{8}{21}, \frac{5}{18}, \frac{1}{63}, \frac{8}{11}$

REVIEW AND PRACTICE

Oral

1. What change should I receive out of \$2 for a purchase of \$.50? \$.75? \$.85? \$.45? \$1.25? \$1.79? \$.69?

2. Henry bought a top for 3 cents, some candy for 11 cents, and a pencil for 7 cents. What change should he receive from a quarter?

3. \$240 will buy how many typewriters at \$60 apiece? At \$80 apiece?

4. 8 cows at \$40 a head cost how much?

5. What is the cost of 2 bushels of potatoes at 20¢ a peck?

6. $800 + 500 + 700 + 1500 = ?$

7. Name the prime factors of 90.

8. Tell the value of $\frac{12}{3}$; $\frac{16}{6}$; $\frac{21}{5}$; $\frac{32}{7}$; $\frac{1200}{600}$.

9. Change to improper fractions $8\frac{1}{4}$; $2\frac{5}{9}$; $17\frac{2}{3}$; $5\frac{11}{12}$; $24\frac{1}{2}$; $12\frac{3}{7}$; $9\frac{7}{12}$.

10. What is a fraction? If you change $\frac{3}{4}$ to eighths, how will its value be affected? How will the number of parts be changed? How will the size of the parts be changed?

11. How does $\frac{1}{2}$ compare with $\frac{1}{4}$? Show this by a drawing.

12. Which is larger, $\frac{1}{3}$ of an apple or $\frac{1}{2}$ of an apple? $\frac{6}{12}$ or $\frac{1}{2}$? $\frac{2}{3}$ or $\frac{6}{9}$?

13. Which is greater, $\frac{2}{3}$ or $\frac{3}{5}$?

14. 29 pounds are how many times 5 pounds? Compare \$250 with \$50; 1 qt. with 1 pt.; 80¢ with 20¢.

15. Compare 2 cents with 50 cents; 2 gal. with 3 gal.; 8 lb. with 64 lb.: \$.25 with \$1.50.

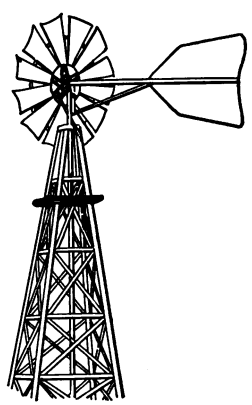
16. Find the cost of 24 souvenir cards at the rate of 3 for 5 cents.

17. A windmill turned 20 times a minute with a certain wind. The owner oiled the bearings of the mill and then it turned 24 times a minute with the same wind.

a. How many turns per hour were gained by oiling the bearings?

b. How many times as much work did the mill do after oiling as before oiling?

c. What part as much work did the mill perform before oiling as after oiling?



Written

Land Surfaces in Square Miles

New York	47620	Rhode Island	1080
Texas	262290	Pennsylvania	44980
Nebraska	76840	Connecticut	4850
Delaware	1960	Illinois	56000
California	155980	Montana	145310
Kentucky	40000	Massachusetts	8040
New Jersey	7450	New Hampshire	9000
District of Columbia	60	Alaska	(nearly) 570390

NOTE 1. — Water surfaces are not included in the above figures.

NOTE 2. — While answering questions 1–5, keep your geography before you, open at the map of the United States. By referring to the map, estimate each answer before computing it, and then compare your estimate with the result obtained by computation.

1. *a.* Texas contains how many times as much land as New York? *b.* It contains how many more square miles of land than New York?

2. Alaska would make how many states the size of New Hampshire?

3. Compare, by division, the land areas of:
   - *a.* Alaska and Illinois.
   - *b.* Illinois and New Hampshire.
   - *c.* New Jersey and Pennsylvania.
   - *d.* Rhode Island and Texas.
   - *e.* Massachusetts and New York.
   - *f.* Connecticut and California.
   - *g.* Montana and Delaware.
   - *h.* Rhode Island and District of Columbia.

4. Compare, by subtraction, the land areas of:
   - *a.* Nebraska and Pennsylvania.

b. Delaware and New Hampshire.
c. Kentucky and Rhode Island.
d. Illinois and Massachusetts.
e. Texas and Alaska.

5. *a.* Find which of the columns of land surfaces (top of page 252) indicates the greater number of square miles.
b. What is the difference?
Make other problems from the above table.

6. Find the prime factors of 1232.

7. Reduce $365\frac{1}{4}$ and $66\frac{2}{3}$ to improper fractions.

8. Reduce $\frac{72}{144}$ to lowest terms.

9. How many 15ths are there in 39?

10. Find the value of $\frac{500}{29}$; $\frac{625}{37}$; $\frac{481}{19}$.

11. How many 40ths are there in $7\frac{5}{8}$?

12. 7 is equal to what fraction having 7 for a denominator?

13. *Reduce to lowest terms:*

a. $\frac{728}{784}$ *b.* $\frac{120}{216}$ *c.* $\frac{245}{385}$ *d.* $\frac{42}{140}$ *e.* $\frac{150}{900}$ *f.* $\frac{28}{154}$ *g.* $\frac{112}{480}$

14. *Reduce to fractions having the least common denominator:*

a. $\frac{7}{9}, \frac{13}{18}, \frac{3}{10}$ *b.* $\frac{5}{14}, \frac{16}{21}, \frac{31}{35}$ *c.* $\frac{8}{11}, \frac{2}{3}, \frac{3}{8}$

ADDITION OF FRACTIONS AND MIXED NUMBERS

. *A number is in its* **simplest form** *when it is in the form of an integer, or a proper fraction in its lowest terms, or a mixed number whose fractional part is in its lowest terms; e.g.* 18, $\frac{3}{7}$ and $5\frac{1}{9}$ are in their simplest forms; $\frac{26}{2}$, $\frac{21}{24}$, $\frac{46}{9}$ and $8\frac{3}{6}$ are not in their simplest forms. Why?

Answers should always be expressed in simplest form, unless the question requires a different form.

Oral

Add:

1. $\frac{1}{2}, \frac{1}{3}$
2. $\frac{2}{3}, \frac{1}{2}$
3. $\frac{2}{3}, \frac{1}{4}$
4. $\frac{3}{4}, \frac{2}{3}$
5. $\frac{1}{4}, \frac{1}{5}$
6. $\frac{3}{5}, \frac{1}{3}$
7. $\frac{1}{7}, \frac{1}{2}$
8. $\frac{1}{3}, \frac{1}{6}$
9. $\frac{2}{7}, \frac{1}{3}, 3$
10. $\frac{1}{4}, \frac{1}{2}, 1\frac{1}{2}$
11. $2\frac{1}{3}, 4\frac{1}{2}, 1$
12. $\frac{1}{7}, \frac{1}{2}, \frac{1}{14}$
13. $1\frac{1}{4}, 2\frac{1}{2}, \frac{1}{3}$
14. $3\frac{1}{3}, 1\frac{2}{5}, 5$
15. $\frac{6}{7}, 3\frac{1}{2}, 4$
16. $2\frac{1}{8}, 3\frac{1}{4}, 2\frac{1}{2}$

17. A man paid $\$\frac{3}{4}$ for a book, $\$\frac{4}{5}$ for an inkstand, and $\$\frac{1}{4}$ for writing paper. How much did he spend?

18. Mary had $\$\frac{3}{4}$; her mother gave her $\$3\frac{1}{2}$. How much had she then?

19. The addends are $7\frac{2}{3}$, $16\frac{1}{3}$, $10\frac{18}{24}$. What is the sum?

20. Mary walked $5\frac{3}{8}$ miles on Monday, 4 miles on Tuesday, $5\frac{5}{8}$ miles on Wednesday, and as far during the next three days as during these days. How far did she walk in all?

Written

$\frac{7}{9} + \frac{9}{16} + \frac{11}{12} = ?$

2	9	8	6
2	9	4	3
3	3	4	1

$2 \times 2 \times 3 \times 3 \times 4 = 144$, L. C. D.

$\frac{7}{9} = \frac{112}{144}$
$\frac{9}{16} = \frac{81}{144}$
$\frac{11}{12} = \frac{132}{144}$

$\frac{325}{144} = 2\frac{37}{144}$ *Sum.*

Add $10\frac{3}{5}$, $7\frac{5}{8}$, and $6\frac{3}{4}$.

$10\frac{3}{5} = 10\frac{24}{40}$
$7\frac{5}{8} = 7\frac{25}{40}$
$6\frac{3}{4} = 6\frac{30}{40}$

$23\frac{79}{40} = 24\frac{39}{40}$ *Sum.*

We add the whole numbers and fractions separately, and then unite the sums.

Add:

1. $\frac{5}{7}, \frac{1}{14}, \frac{1}{2}$
2. $\frac{1}{5}, \frac{1}{3}, \frac{7}{15}$
3. $\frac{2}{3}, \frac{5}{9}, \frac{7}{18}$
4. $\frac{5}{6}, \frac{3}{4}, \frac{2}{3}$
5. $\frac{5}{12}, \frac{1}{2}, \frac{5}{4}$
6. $\frac{1}{8}, \frac{3}{4}, \frac{1}{2}, \frac{3}{16}$
7. $\frac{2}{5}, \frac{3}{10}, \frac{7}{20}, \frac{1}{2}$
8. $\frac{2}{3}, \frac{1}{8}, \frac{5}{12}, \frac{7}{24}$
9. $\frac{1}{4}, \frac{3}{5}, \frac{5}{6}, \frac{7}{8}$
10. $\frac{3}{4}, \frac{4}{5}, 6, \frac{4}{9}$
11. $\frac{3}{4}, \frac{4}{9}, \frac{7}{11}, \frac{3}{5}$
12. $\frac{3}{8}, \frac{9}{10}, \frac{3}{4}, \frac{4}{5}$
13. $\frac{1}{2}, 2\frac{2}{5}, \frac{2}{3}, 6$
14. $\frac{4}{5}, \frac{3}{8}, 2\frac{1}{4}, \frac{7}{10}$
15. $4\frac{5}{9}, \frac{2}{7}, \frac{1}{3}, \frac{8}{21}$
16. $\frac{3}{5}, \frac{1}{2}, \frac{9}{10}, 4$
17. $6\frac{3}{4}, 8\frac{2}{3}, \frac{6}{7}, \frac{1}{8}$
18. $3, \frac{2}{3}, \frac{1}{7}, \frac{3}{6}$
19. $\frac{5}{6}, 4, \frac{2}{3}, 1\frac{4}{5}$
20. $\frac{3}{5}, \frac{7}{6}, \frac{7}{10}, \frac{8}{15}$
21. $6\frac{2}{3}, 8\frac{1}{2}, 5\frac{3}{4}, 7\frac{5}{8}$
22. $9\frac{1}{5}, 5\frac{2}{7}, 9, \frac{13}{35}$
23. $\frac{5}{3}, \frac{5}{6}, \frac{6}{8}, \frac{2}{4}$
24. $5\frac{1}{4}, 7\frac{3}{8}, 9\frac{1}{6}, 45$

25. What is the sum of $14\frac{3}{7}$, $9\frac{5}{8}$, $10\frac{1}{2}$, and $12\frac{3}{14}$?

26. A man travels $25\frac{2}{3}$ miles on Monday, $37\frac{3}{5}$ miles on Tuesday, and on Wednesday as many miles as on Monday and Tuesday. How many miles does he travel in three days?

27. A farmer has $27\frac{1}{2}$ bushels of potatoes in one bin, $133\frac{3}{9}$ bushels in another, $47\frac{5}{18}$ bushels in another. How many bushels has he?

28. How many yards of cloth will I have, if I buy $123\frac{7}{8}$ yards, $76\frac{3}{4}$ yards, and $58\frac{2}{3}$ yards?

29. $2\frac{1}{8}$ yards of cloth are required for a coat, $1\frac{1}{3}$ yards for trousers, and $\frac{3}{8}$ of a yard for a vest. How many yards are required for the whole suit?

SUBTRACTION OF FRACTIONS AND MIXED NUMBERS

Oral

1. $\frac{3}{4} - \frac{1}{4}$
2. $\frac{3}{5} - \frac{1}{2}$
3. $\frac{5}{6} - \frac{1}{3}$
4. $\frac{1}{2} - \frac{1}{6}$
5. $\frac{9}{14} - \frac{2}{7}$
6. $\frac{3}{4} - \frac{5}{8}$
7. $\frac{9}{10} - \frac{3}{5}$
8. $\frac{19}{24} - \frac{3}{4}$
9. $7 - \frac{1}{2}$
10. $8 - \frac{3}{5}$
11. $12 - 1\frac{1}{12}$
12. $22 - 1\frac{3}{15}$
13. $4 - 1\frac{1}{2}$
14. $6\frac{1}{3} - 4\frac{2}{3}$
15. $11 - 8\frac{2}{3}$

16. $19\frac{1}{7} - 9\frac{5}{7}$
17. $\frac{2}{3} - \frac{1}{4}$
18. $\frac{1}{2} - \frac{1}{3}$
19. $\frac{7}{8} - \frac{1}{2}$
20. $6 - \frac{1}{3}$
21. $3\frac{1}{4} - \frac{3}{4}$
22. $15 - 2\frac{1}{2}$
23. $10 - \frac{5}{7}$
24. $12\frac{1}{4} - 5\frac{1}{2}$
25. $8\frac{1}{2} - 4\frac{1}{4}$
26. $1\frac{7}{18} - \frac{2}{9}$
27. $\frac{3}{4} - \frac{1}{3}$

Written

From $\frac{11}{15}$ take $\frac{4}{9}$.

$\frac{11}{15} = \frac{33}{45}$
$\frac{4}{9} = \frac{20}{45}$
$\frac{13}{45}$ *Difference*

How is 45 obtained?

From $29\frac{1}{6}$ take $13\frac{7}{10}$.

$29\frac{1}{6} = 29\frac{5}{30} = 28\frac{35}{30}$
$13\frac{7}{10} = 13\frac{21}{30}$
$15\frac{14}{30} = 15\frac{7}{15}$ *Difference*

How do we obtain $\frac{35}{30}$?

1. Take $\frac{1}{5}$ from $\frac{5}{6}$.
2. From $\frac{19}{20}$ take $\frac{9}{11}$.
3. Find the difference between $\frac{15}{17}$ and $\frac{17}{34}$.
4. Take $91\frac{4}{5}$ from $178\frac{1}{3}$.
5. $3\frac{1}{3} - \frac{3}{5}$
6. $6\frac{1}{2} - 4\frac{2}{3}$
7. $42\frac{3}{5} - 33\frac{5}{7}$
8. $198\frac{3}{5} - 49\frac{2}{3}$
9. $3\frac{7}{8} - 2\frac{8}{9}$
10. $16\frac{2}{3} - 8\frac{5}{6}$
11. $\frac{1}{7} - \frac{1}{8}$
12. $\frac{7}{8} - \frac{7}{12}$
13. $\frac{27}{40} - \frac{3}{8}$
14. $8\frac{1}{7} - 5\frac{1}{2}$
15. $210\frac{1}{2} - 109\frac{5}{9}$
16. $12\frac{1}{5} - 5\frac{1}{3}$
17. $7\frac{2}{3} - 5\frac{4}{5}$
18. $46\frac{3}{5} - 27\frac{7}{9}$
19. $1867\frac{2}{3} - 976\frac{3}{4}$
20. $32\frac{1}{3} - 26\frac{5}{7}$
21. $13\frac{7}{10} - 3\frac{7}{20}$
22. $481\frac{3}{15} - 232\frac{7}{10}$
23. $862\frac{5}{9} - 46\frac{5}{7}$
24. $230\frac{1}{2} - 140\frac{3}{11}$
25. $89\frac{7}{9} - 43\frac{1}{2}$
26. $807\frac{1}{17} - 298\frac{1}{3}$
27. $190\frac{2}{5} - 28\frac{4}{7}$
28. $281\frac{4}{11} - 37\frac{1}{2}$

29. A piece of silk contains $18\frac{1}{4}$ yd. How many yards will be left after $13\frac{1}{8}$ yd. are used?

30. Mrs. Brown bought $4\frac{7}{8}$ yd. of broadcloth and used all but $1\frac{5}{6}$ yd. How much did she use?

31. Find the difference between $256\frac{1}{3}$ and $149\frac{1}{2}$.

32. A man bought a lot at auction for $\$92\frac{4}{5}$ and sold it the next day for $\$105\frac{3}{4}$. What did he gain?

ADDITION AND SUBTRACTION OF FRACTIONS

Written

1. From a piece of cloth containing $47\frac{1}{2}$ yd., $22\frac{2}{3}$ yd. were sold to one lady and $5\frac{3}{4}$ yd. to another. How many yards remained unsold?

2. A farmer sold a load of hay for $\$13\frac{7}{10}$ and another for $\$16\frac{3}{4}$. He was paid \$25. How much was still due?

3. A lady paid $\$1\frac{3}{10}$ for a pair of gloves, $\$3\frac{4}{5}$ for an umbrella, and $\$29\frac{7}{20}$ for dress materials. How much should she have left from four ten-dollar bills?

4. What must be added to the sum of $\frac{5}{6}$ and $10\frac{3}{8}$ to make 20?

5. From the sum of $109\frac{1}{2}$ and $87\frac{2}{9}$ take their difference.

6. A grocer drew at one time $9\frac{1}{8}$ gallons and at another time $15\frac{3}{4}$ gallons from a tank containing $44\frac{3}{16}$ gallons of oil. How many gallons were left?

7. Mary and Alice live on Bryant Avenue, and their school is on the same street, between their homes. Mary walks $40\frac{2}{11}$ rods to school, and Alice $25\frac{16}{33}$ rods. *a.* How much farther does Mary walk than Alice? *b.* How far apart are their homes?

8. It took Mr. Farmer $8\frac{7}{15}$ hours to plow a field, and $13\frac{1}{4}$ hours to plant it. *a.* How much more time was required for planting than for plowing? *b.* How much time was required for both?

9. $13\frac{5}{21} - 2\frac{3}{42} + 7\frac{6}{7} - 4\frac{15}{84} = ?$ Can you find the result in two ways?

10. *a.* $\frac{17}{24} + (\frac{11}{16} - \frac{1}{8}) = ?$ *b.* $8\frac{17}{24} - (\frac{11}{16} + \frac{1}{8}) = ?$

11. Roscoe gave $\frac{1}{3}$ of his new writing pad to his sister and $\frac{1}{5}$ to his brother. What part did he keep?

12. From $16\frac{2}{3} + 12\frac{1}{2} + 5\frac{1}{4}$ take $18\frac{3}{4} + 6\frac{1}{5}$.

13. Add $\frac{5}{6}$, $\frac{5}{8}$, $\frac{5}{12}$, and $\frac{5}{24}$; then subtract $1\frac{1}{2}$ from the sum.

14. After reading $\frac{5}{21}$, $\frac{2}{7}$, and $\frac{1}{3}$ of a book, what part have you yet to read?

15. A owns $79\frac{5}{16}$ acres of land, B $9\frac{7}{48}$ acres less than A, and C $25\frac{19}{24}$ acres less than B. *a.* How many acres has B? *b.* How many acres has C? *c.* How many acres have all three together?

16. From $4223\frac{1}{10}$ take $826\frac{5}{6}$.

17. Take $8\frac{9}{22}$ from $17\frac{3}{11}$.

18. A has $\$64\frac{1}{2}$. B has $\$37\frac{4}{5}$ less than A. How much money have both?

19. $19\frac{7}{16}$ yards of twine were cut from a ball containing $59\frac{7}{12}$ yards. The piece that was left was how much longer than the piece cut off?

20. Add $\frac{7}{8}$, $\frac{8}{9}$, and $\frac{11}{36}$, and subtract the sum from 5.

21. Find the sum of $\frac{3}{8}$, $\frac{4}{5}$, $\frac{9}{10}$, and $\frac{31}{100}$.

22. Find the difference between $\frac{3}{4}$ and $\frac{83}{100}$.

23. A boy walked to his grandfather's in three hours, walking $\frac{39}{100}$ of the distance the first hour and $\frac{7}{25}$ the second hour. What part of the distance did he walk the third hour?

QUICK TEST

1. 39 cents is how much less than one dollar?
2. $25 \times 20 = 1000 \div ?$
3. Which is greater, $\frac{5}{7}$ or $\frac{3}{4}$?
4. 3400 is the product of 100 and what other number?
5. Express $\frac{86}{10}$ in simplest form.
6. Express $\frac{3}{4}$ as 28ths.
7. How far will a motor car run in 12 hours if it runs at the rate of 50 miles in 4 hours?
8. What is the L. C. M. of 2, 3, 4, and 5?
9. What is the G. C. D. of 21, 35, and 49?
10. 16 is the sum of $10\frac{5}{7}$ and what other number?

MULTIPLICATION AND DIVISION COMBINED

Written

$(20 \div 4) \times (21 \div 7) = ?$

$20 \div 4 = 5 \quad 21 \div 7 = 3 \quad 5 \times 3 = 15$ *Ans.*

or,

$$\frac{20}{4} \times \frac{21}{7} = \frac{20 \times 21}{4 \times 7} = 15 \quad \textit{Ans.}$$

20 and 21 are dividends and 4 and 7 are divisors. The result is the same whether we make each division separately and then multiply the quotients, or divide the product of the dividends by the product of the divisors. In many cases the latter way is easier, because we may use cancellation; *e.g.*

a. $(20 \div 4) \times (21 \div 7) = \left(\frac{20}{4} \times \frac{21}{7}\right) = \frac{\overset{5}{\cancel{20}} \times \overset{3}{\cancel{21}}}{\underset{}{\cancel{4}} \times \underset{}{\cancel{7}}} = 15$ *Ans.;*

b. $(18 \div 7) \times (28 \div 24) \times (210 \div 15) = \frac{\overset{3}{\cancel{18}} \times \overset{7}{\cancel{28}} \times \overset{42}{\cancel{210}}}{\underset{6}{\cancel{7}} \times \underset{}{\cancel{24}} \times \underset{5}{\cancel{15}}} = 42$ *Ans.*

Find results:

1. $(12 \div 11) \times (22 \div 5) \times (35 \div 6) \times (15 \div 2)$

2. $(20 \div 6) \times (55 \div 10) \times (42 \div 11)$

3. $(39 \div 13) \times (35 \div 21) \times (12 \div 7) \times (21 \div 3)$

4. $\frac{42}{4} \times \frac{36}{7} \times \frac{63}{14}$

5. $(27 \div 18) \times (35 \div 75) \times (25 \div 12) \times (12 \div 7)$

6. $(68 \div 7) \times (14 \div 8) \times (35 \div 17)$

7. $(52 \div 10) \times (34 \div 13) \times (125 \div 10)$

8. $(26 \div 20) \times (68 \div 13) \times (125 \div 35)$

9. $(70 \div 17) \times (68 \div 24) \times (35 \div 7)$

10. $\frac{75}{42} \times \frac{108}{26} \times \frac{98}{15}$ 11. $\frac{49}{56} \times \frac{24}{34} \times \frac{17}{5} \times \frac{20}{3}$

12. Multiply the quotient of 29 divided by 12 by the quotient of 84 divided by 29.

MULTIPLICATION OF FRACTIONS

Any integer may be **expressed as a fraction** *by writing it as a numerator with* 1 *for a denominator, e.g.;* 5 is the same as $\frac{5}{1}$; 19 is the same as $\frac{19}{1}$; $\frac{2}{3} \times 7 \times \frac{15}{42}$ is the same as $\frac{2}{3} \times \frac{7}{1} \times \frac{15}{42}$.

The word **of**, *between fractions, means the same as the* **sign of multiplication**; *e.g.* $\frac{2}{3}$ of $\frac{8}{9} = \frac{2}{3} \times \frac{8}{9}$; $\frac{2}{3}$ of $4 \times \frac{7}{16} = \frac{2}{3} \times \frac{4}{1} \times \frac{7}{16}$.

An indicated multiplication of two or more fractions is called a **compound fraction**; *e.g.* $\frac{2}{7} \times \frac{8}{9}$; $\frac{3}{16} \times \frac{12}{21} \times \frac{24}{25}$; $\frac{5}{7}$ of $\frac{3}{8}$.

Written

1. Find the product of $\frac{2}{3}$, $\frac{5}{7}$, and $\frac{9}{16}$.

Each of these fractions indicates what operation?

Since all the numerators are dividends and all the denominators are divisors, we may find the result by dividing the product of the numerators by the product of the denominators, as on page 259, using cancellation:

$$\frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{3}}} \times \frac{5}{7} \times \frac{\overset{3}{\cancel{9}}}{\underset{8}{\cancel{16}}} = \frac{15}{56} \quad \textit{Ans.}$$

Find the products:

2. $\frac{3}{4} \times \frac{4}{5}$

3. $\frac{9}{10} \times \frac{5}{8}$

4. $\frac{7}{9}$ of $\frac{9}{14}$

5. $\frac{5}{6}$ of $\frac{12}{20}$

6. $\frac{7}{19} \times \frac{9}{14}$

7. $\frac{3}{4}$ of $\frac{1}{2}$ of $\frac{2}{3}$

8. $\frac{5}{6}$ of $\frac{9}{10}$ of $\frac{4}{5}$

9. $\frac{4}{9} \times \frac{3}{12} \times \frac{6}{7}$

10. $\frac{5}{16} \times \frac{8}{9} \times \frac{3}{4}$

11. $\frac{9}{25} \times \frac{10}{7} \times \frac{8}{9}$

12. $\frac{12}{17} \times 34 \times \frac{5}{8}$

13. $\frac{2}{9}$ of 15

14. $\frac{2}{3} \times 7 \times \frac{15}{42}$

15. $\frac{2}{3}$ of $\frac{8}{9} \times 14$

16. $\frac{5}{11} \times \frac{16}{15} \times 22$

17. $2 \times \frac{3}{8}$ of $\frac{7}{12}$

18. $\frac{3}{17}$ of $34 \times \frac{5}{16}$

Find the value:

19. $\frac{4}{5}$ of 40

20. $\frac{6}{7}$ of 42

21. $\frac{3}{5}$ of 16

22. $\frac{5}{8}$ of 328

23. $\frac{3}{7}$ of 721

24. $\frac{4}{5}$ of 90

25. $\frac{17}{18}$ of 342

26. $\frac{15}{16}$ of 800

27. $\frac{9}{11}$ of 2222

28. Find the areas of rectangles having these dimensions:

a. $\frac{7}{8}$ in. by $\frac{5}{8}$ in.

b. $\frac{2}{3}$ yd. by $\frac{3}{4}$ yd.

c. $\frac{5}{11}$ rd. by $\frac{2}{3}$ rd.

d. $\frac{3}{4}$ ft. by $\frac{8}{9}$ ft.

e. $\frac{63}{80}$ mi. by $\frac{56}{99}$ mi.

f. $\frac{5}{11}$ mi. by $\frac{44}{45}$ mi.

g. $\frac{7}{8}$ mi. by $\frac{40}{99}$ mi.

h. $\frac{11}{15}$ mi. by $\frac{45}{88}$ mi.

29. What is the cost of $\frac{2}{3}$ of 24 quarts of milk at $5\frac{1}{2}$ cents a quart?

30. A grocer bought 27 barrels of apples and sold $\frac{5}{9}$ of them at $\$2\frac{1}{5}$ a barrel. How much money did he receive?

Oral

1. How much is $\frac{1}{2}$ of $\frac{1}{4}$ of an inch?

2. Illustrate that $\frac{1}{4}$ of $\frac{1}{2}$ of an apple is $\frac{1}{8}$ of an apple.

3. Multiply $\frac{3}{5}$ by $\frac{1}{4}$; $\frac{4}{5}$ by $\frac{1}{2}$; $\frac{1}{2}$ by $\frac{1}{3}$; $\frac{1}{6}$ by $\frac{1}{2}$.

4. How much is $\frac{1}{4}$ of $\frac{4}{7}$? $\frac{3}{5}$ of $\frac{5}{7}$? $\frac{1}{4}$ of $\frac{4}{5}$? $\frac{1}{6}$ of $\frac{6}{11} = ?$

5. A man owned $\frac{3}{4}$ of a farm and sold $\frac{1}{2}$ of his share. What part of the farm did he sell?

6. James had $\$\frac{3}{4}$, and John $\frac{2}{3}$ as much. How much had both?

7. If a pound of tea costs $\$\frac{3}{5}$, what will $\frac{1}{4}$ pound cost?

8. $\frac{1}{3}$ of $\frac{1}{3}$ of a square yard is what part of a square yard? Show it by a drawing.

9. Frank gave Harry $\frac{1}{2}$ of his apple and Harry gave away $\frac{2}{3}$ of his piece. What part of the apple did Harry give away?

10. Mr. Greeley, having an acre of ground, took $\frac{1}{4}$ of it for a garden. He planted $\frac{1}{3}$ of the garden to potatoes and $\frac{1}{2}$ as much to corn. What part of an acre of corn did he have?

Mixed numbers may be reduced to improper fractions and then multiplied; thus,

$$1\tfrac{2}{3} \times 8\tfrac{1}{2} \times \tfrac{5}{17} \times 4 =$$

$$\frac{5}{3} \times \frac{\cancel{17}}{\cancel{2}} \times \frac{5}{\cancel{17}} \times \frac{\cancel{4}^{2}}{1} = \frac{50}{3} = 16\tfrac{2}{3} \quad \textit{Ans.}$$

Written

1. $4\frac{3}{4} \times 5\frac{1}{2}$

2. $11\frac{9}{11} \times 7\frac{1}{3}$

3. $177\frac{2}{3} \times 3$

4. $35\frac{4}{5} \times 27\frac{8}{9}$

5. $28\frac{1}{2} \times 17\frac{3}{5}$

6. Find $\frac{3}{11}$ of $\frac{5}{8}$ of $\frac{11}{12}$ of $8\frac{1}{5}$

7. $4\frac{1}{2} \times 7\frac{2}{3}$

8. $5\frac{2}{3} \times 8\frac{6}{7} \times \frac{5}{17}$

9. $\frac{8}{11} \times 25\frac{2}{3} \times \frac{5}{8}$

10. $3\frac{1}{2} \times 9\frac{1}{7} \times 6\frac{5}{6}$

11. Multiply $10\frac{1}{2}$ by $\frac{2}{3}$ by $\frac{3}{7}$ by $6\frac{2}{3}$.

12. Multiply: *a*. $15\frac{7}{9}$ by $14\frac{2}{7}$. *b*. 16 by $\frac{7}{12}$.

13. $5\frac{3}{4} \times 2\frac{4}{5} \times 20$

14. $7\frac{1}{2} \times 5\frac{4}{5} \times \frac{3}{7}$

15. $9\frac{1}{4} \times \frac{4}{37} \times 2\frac{1}{5}$

16. $6\frac{1}{4} \times 1\frac{1}{25} \times \frac{5}{11}$

17. $\frac{7}{16} \times 4 \times 5\frac{1}{2}$

18. $\frac{9}{10} \times 80 \times 5\frac{1}{2}$

19. If a man earns $\$2\frac{7}{8}$ a day, how much does he earn in 35 days?

20. Multiply $\frac{2}{9}$ by $\frac{5}{6}$ by $\frac{27}{36}$ by $\frac{81}{90}$ by $\frac{9}{21}$.

21. Find the cost of 16 bushels of oats at $37\frac{1}{2}¢$ a bushel.

22. Mrs. A buys $3\frac{1}{2}$ qt. of milk a day. What does she pay for it at $5\frac{1}{2}¢$ a quart?

23. Show by a diagram that $\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{6}$.

24. How far can Joe ride in $3\frac{3}{8}$ hours if he rides $9\frac{1}{3}$ miles an hour?

25. How many square feet of floor are there in a room $12\frac{1}{3}$ ft. by $7\frac{1}{2}$ ft?

26. Find the cost of 86 cords of wood at $\$4\frac{3}{4}$ a cord.

27. Find the value of $\frac{2}{3}$ of a chest of tea weighing $57\frac{1}{2}$ lb. at $\$\frac{3}{5}$ per pound.

28. *a*. $\frac{7}{8}$ of $\frac{5}{9}$ of $\frac{6}{7}$ of $\frac{2}{3}$ of $\frac{4}{5} = ?$ *b*. $\frac{9}{10}$ of $\frac{6}{7}$ of $\frac{11}{2}$ of $\frac{6}{11} = ?$

29. *a*. $\frac{6}{11}$ of $\frac{33}{12}$ of $\frac{9}{10}$ of $\frac{15}{20}$ of $\frac{2}{3} = ?$ *b*. $\frac{7}{8}$ of $\frac{16}{21}$ of $\frac{4}{5}$ of $\frac{25}{28} = ?$

30. Mr. Brown earns $\$60\frac{3}{4}$ a month, and his son $\frac{2}{3}$ as much. How much does the son earn?

31. At $\$12\frac{1}{2}$ a ton, how much will $9\frac{3}{20}$ tons of hay cost?

32. What will be the cost of $48\frac{3}{4}$ yards of cloth at $\$\frac{4}{5}$ a yard?

A FRACTION IN THE MULTIPLICAND

In multiplying a large mixed number by an integer, time may often be saved by multiplying the whole number and the fraction separately, then adding the products, thus: $314\frac{7}{9} \times 5 = ?$

$$\begin{array}{r} 314\frac{7}{9} \\ \underline{\quad 5} \\ 3\frac{8}{9} = \frac{7}{9} \times 5 \\ 1570 = 314 \times 5 \\ \hline 1573\frac{8}{9} = 314\frac{7}{9} \times 5 \end{array}$$

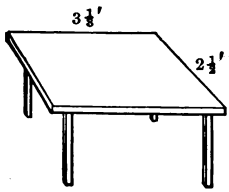
Multiply:

1. $248\frac{2}{3}$ by 5
2. $39\frac{7}{11}$ by 3
3. $42\frac{9}{13}$ by 6
4. $850\frac{1}{6}$ by 15
5. $29\frac{2}{7}$ by 11
6. $98\frac{3}{11}$ by 8
7. $35\frac{2}{7}$ by 7
8. $49\frac{3}{13}$ by 13
9. $207\frac{2}{3}$ by 3
10. $38\frac{5}{16}$ by 16
11. $224\frac{1}{13}$ by 9
12. $42\frac{3}{17}$ by 12
13. $651\frac{8}{29}$ by 16
14. $201\frac{23}{32}$ by 16
15. $431\frac{31}{48}$ by 72

REVIEW AND PRACTICE

Oral

1. Read 305,027,503,060; XLVI; CXII; CCIV; XCIII.
2. If 2 sheep are worth \$7, what are 8 such sheep worth?
3. If I make a purchase for \$9.15, what change should I receive for a \$10 bill?
4. Express in simplest form: $\frac{6}{10}$; $\frac{15}{3}$; $\frac{25}{8}$; $\frac{25}{50}$; $6\frac{5}{10}$; $\frac{21}{8}$.



5. Find the area of this table top.
6. $280 \div 70 = ?$ $640 \div 40 = ?$
7. Find the product of 32 and 20.
8. $? \div \frac{5}{8} = \frac{4}{5}$ $\frac{1}{9} + \frac{1}{7} = ?$ $\frac{3}{8} \div ? = \frac{4}{5}$.
9. Name two numbers that are prime to each other.

Written

1. Express in figures one hundred twenty-five million, ten thousand, seven.

2. Find the G. C. D. of 126, 210, and 294.

3. Find the L. C. M. of 720 and 216.

4. Divide the product of 144, 25, and 56 by the product of 48, 120, and 105, using cancellation.

5. When potatoes are worth 55¢ a bushel, how many bushels must be given in exchange for 3 jars of butter, each containing 33 lb. at 25¢ a pound? Indicate the work, and cancel.

6. When \$150 will buy 189 bushels of wheat, how many bushels will \$50 buy? (\$50 is what part of \$150?)

7. Express in simplest form: *a*. $\frac{232}{376}$ *b*. $\frac{588}{37}$ *c*. $\frac{240}{312}$ *d*. $17\frac{169}{195}$.

8. Reduce $\frac{216}{240}$ to a fraction whose terms are prime to each other.

9. How many 40ths are there in $7\frac{5}{8}$?

10. A certain block in our city is $\frac{11}{40}$ of a mile long and $\frac{16}{33}$ of a mile wide. What part of a square mile of land is it?

11. Find the area of both sides of a square piece of cardboard whose edge is $15\frac{3}{8}$ inches.

DIVISION OF FRACTIONS

Divide $\frac{35}{72}$ by $\frac{5}{8}$.

Since $\frac{35}{72}$ is a product and $\frac{5}{8}$ is one of its factors, we may state the question thus:

$$\frac{5}{8} \times ? = \frac{35}{72} \quad \text{or} \quad \frac{5 \times ?}{8 \times ?} = \frac{35}{72}.$$

To find the required factor we must divide the numerator 35 by 5, and the denominator 72 by 8, thus: $\frac{35 \div 5}{72 \div 8} = \frac{7}{9}$.

That is exactly what we should do if the question were:

$$\frac{35}{72}\times\frac{8}{5}=? \qquad \overset{7}{\cancel{35}}\times\frac{\overset{8}{\cancel{72}}}{\underset{9}{\cancel{5}}}=\frac{7}{9}.$$

The latter method is the more convenient, especially when the numerator of the divisor is not exactly contained in the numerator of the dividend or the denominator of the divisor in the denominator of the dividend.

Therefore, *to divide by a fraction we interchange the terms of the divisor and multiply.*

Written

1. Divide $4\frac{2}{3}$ by $5\frac{3}{5}$.

Solution: $4\frac{2}{3}\div 5\frac{3}{5}=\frac{14}{3}\div\frac{28}{5}=\frac{\overset{1}{\cancel{14}}}{3}\times\frac{5}{\underset{2}{\cancel{28}}}=\frac{5}{6}$ *Ans.*

(How do we treat mixed numbers?)

2. Divide 47 by $6\frac{1}{2}$.

Solution: $47\div 6\frac{1}{2}=\frac{47}{1}\div\frac{13}{2}=\frac{47}{1}\times\frac{2}{13}=\frac{94}{13}=7\frac{3}{13}$ *Ans.*

(How do we treat integers?)

3. $\frac{8}{11}\div\frac{4}{33}$
4. $\frac{7}{8}\div\frac{3}{4}$
5. $\frac{11}{12}\div\frac{5}{6}$
6. $\frac{5}{18}\div\frac{3}{4}$
7. $\frac{16}{27}\div\frac{2}{3}$
8. $\frac{14}{15}\div\frac{7}{10}$
9. $3\frac{1}{2}\div\frac{14}{15}$
10. $5\frac{1}{4}\div\frac{9}{20}$
11. $\frac{3}{11}\div 5\frac{3}{4}$
12. $\frac{7}{10}\div 4\frac{1}{5}$
13. $1\frac{3}{15}\div 5\frac{1}{2}$
14. $2\div\frac{4}{5}$
15. $8\div\frac{7}{10}$
16. $10\div\frac{5}{6}$
17. $\frac{7}{8}\div 14$
18. $\frac{16}{21}\div 8$
19. $2\frac{3}{4}\div 5\frac{1}{2}$
20. $7\frac{1}{8}\div 1\frac{1}{2}$
21. $2\frac{3}{4}\div\frac{11}{12}$
22. $2\frac{1}{3}\div 3\frac{1}{2}$
23. $8\frac{1}{9}\div 9\frac{1}{7}$
24. $4\frac{9}{72}\div\frac{14}{27}$
25. $4\frac{2}{55}\div\frac{7}{11}$
26. $10\frac{2}{9}\div 4\frac{10}{27}$

27. By what must $\frac{24}{35}$ be multiplied to make $\frac{36}{77}$?

28. One factor of $\frac{34}{49}$ is $\frac{17}{84}$. What is the other?

29. How many pieces $\frac{7}{8}$ of an inch long can be cut from a wire that is $10\frac{1}{2}$ inches long?

30. When $3\frac{3}{8}$ lb. of beef steak are worth $57\frac{3}{8}$ cents, what is the value of one pound?

Division of fractions is sometimes indicated by writing the dividend above and the divisor below a line. Such an expression is called a **complex fraction**; *e.g.*

$$\frac{3}{8\frac{2}{5}},\quad \frac{\frac{2}{3}}{16},\quad \frac{5\frac{1}{2}}{25},\quad \frac{3\frac{2}{3}}{7\frac{1}{9}},\quad \text{and}\quad \frac{\frac{2}{3}+9}{1\frac{3}{8}-\frac{2}{5}}$$

are complex fractions. Read each fraction.

A fraction whose terms are integers is a **simple fraction**; *e.g.* $\frac{11}{12}$ is a simple fraction.

1. Reduce $\frac{7}{8\frac{2}{3}}$ to a simple fraction.

$$\frac{7}{8\frac{2}{3}}=7\div 8\tfrac{2}{3}=\frac{7}{1}\div\frac{26}{3}=\frac{7}{1}\times\frac{3}{26}=\frac{21}{26}.\quad \textit{Ans.}$$

2. Reduce $\frac{\frac{5}{17}}{40}$ to a simple fraction.

$$\frac{\frac{5}{17}}{40}=\frac{5}{17}\div 40=\frac{\cancel{5}}{17}\times\frac{1}{\cancel{40}_{8}}=\frac{1}{136}.\quad \textit{Ans.}$$

3. Reduce $\frac{7\frac{5}{8}}{2\frac{13}{20}}$ to its simplest form.

$$\frac{7\frac{5}{8}}{2\frac{13}{20}}=7\tfrac{5}{8}\div 2\tfrac{13}{20}=\frac{61}{8}\div\frac{53}{20}=\frac{61}{\cancel{8}_{2}}\times\frac{\overset{5}{\cancel{20}}}{53}=\frac{305}{106}=2\tfrac{93}{106}.\quad \textit{Ans.}$$

In examples 4–13 *change the given complex fractions to simple fractions by performing the indicated divisions:*

4. $\dfrac{7\frac{1}{9}}{\frac{16}{27}}$ **6.** $\dfrac{15\frac{3}{4}}{4}$ **8.** $\dfrac{19}{16\frac{4}{5}}$ **10.** $\dfrac{3\frac{1}{2}}{\frac{7}{10}}$ **12.** $\dfrac{\frac{1}{4}\text{ of }\frac{7}{8}}{\frac{2}{3}\text{ of }\frac{5}{6}}$

5. $\dfrac{18\frac{1}{2}}{\frac{4}{5}}$ **7.** $\dfrac{17\frac{1}{8}}{16}$ **9.** $\dfrac{\frac{7}{8}}{\frac{9}{16}}$ **11.** $\dfrac{18}{\frac{9}{16}}$ **13.** $\dfrac{\frac{2}{3}\text{ of }5\frac{1}{2}}{\frac{7}{8}}$

14. If $\frac{3}{5}$ of an acre of land is worth $\$ 72\frac{3}{10}$, what is the value of an acre at the same rate?

15. There are $5\frac{1}{2}$ yards in a rod. How many rods in $70\frac{1}{8}$ yards?

16. At $\$ 6\frac{1}{4}$ a ton, how many tons of coal can be bought for $\$ 73\frac{1}{2}$?

EXAMPLES FOR PRACTICE

1. $2\frac{1}{7} \times \frac{7}{8} \div 1\frac{1}{2} = ?$

2. Multiply $\frac{12}{17}$ by $\frac{13}{16}$ and divide the product by $1\frac{3}{17}$.

3. *a.* $14\frac{2}{3} \div 7\frac{1}{3} = ?$ *b.* $7\frac{1}{3} \div 14\frac{2}{3} = ?$

4. Change to a simple fraction $\dfrac{7\frac{1}{2}}{\frac{3}{4} \times 12\frac{1}{2}}$.

5. $45\frac{1}{2} \div 6\frac{1}{2} - \frac{3}{8} + \frac{1}{16} = ?$

6. What is one third of one hundred seventy-five and one half?

7. The multiplicand is $1\frac{5}{18}$ and the product is $2\frac{5}{54}$. Find the multiplier.

8. Simplify $\dfrac{2\frac{1}{4} \div \frac{3}{5}}{4\frac{1}{12} - \frac{5}{6}}$.

9. How many pounds of sugar at $6\frac{1}{4}$ cents a pound will pay for $12\frac{1}{2}$ dozen eggs at 16 cents a dozen?

10. When 15 yards of silk cost $\$16\frac{7}{8}$, what is the price per yard?

11. Divide $75\frac{3}{5}$ by $14\frac{3}{7}$.

12. Find the value of $\frac{5\frac{3}{10}}{1\frac{1}{2}} - \frac{1\frac{3}{5}}{\frac{15}{16}}$.

13. In one month Mr. Finlay earned $\$46\frac{3}{4}$, his wages being $\$2\frac{3}{4}$ a day. How many days did he work?

14. Divide $\frac{3}{4}$ of $\frac{2}{3}$ of $2\frac{3}{5}$ by $\frac{7}{9}$ of $\frac{2}{5}$ of 7.

15. $\$75$ will pay for how much corn at $\$\frac{3}{5}$ a bushel?

16. Divide the sum of $4\frac{7}{8}$ and $5\frac{2}{3}$ by their difference.

17. If $\frac{7}{8}$ of a mile of telephone wire was divided into 14 equal pieces, how long was each piece?

18. By what must $2\frac{1}{8}$ be multiplied to obtain $2\frac{3}{7}$?

19. By what must $3\frac{3}{9}$ be divided to obtain $1\frac{4}{11}$?

20. How many aprons can be made from $10\frac{1}{2}$ yards of cloth, if $1\frac{3}{4}$ yards are enough for one apron?

21. Divide $85\frac{1}{7}$ by $14\frac{2}{3}$.

AVERAGES

1. Jacob weighed six of his chickens, and found their weights to be 68 oz., 40 oz., 63 oz., 47 oz., 55 oz., and 70 oz. What was the average weight of the chickens?

SOLUTION

68 oz.
40 oz.
63 oz.
47 oz.
55 oz.
70 oz.
6)343 oz. *Total weight.*
$57\frac{1}{6}$ oz. *Average weight, Ans.*

2. Harry's marks in spelling for a month were as follows:

	1st Week	2d Week	3d Week	4th Week
Monday	80	75	78	80
Tuesday	86	90	84	88
Wednesday	83	82	90	92
Thursday	88	80	86	96
Friday	92	76	90	100

a–*d*. Find Harry's average for each week.

e–*i*. Find his average for all the Mondays, all the Tuesdays, etc.

j. How much higher was his fourth week's average than his average for all the Mondays?

k. On which day of the week did he spell best?

l. What was Harry's general average for the month?

3. Here are the standings of seven girls in three examinations:

	Marion	Frances	Dorothy	Helen	Jessie	Hazel	Ruth
Arithmetic,	70	93	98	92	70	83	95
Geography,	93	90	76	98	90	84	80
Language,	95	88	95	79	96	85	76

a. Which girl has the highest average?

b. What is the average of the class in language? *c*. In arithmetic? *d*. In geography?

e. Find the difference between Marion's average and Hazel's. *f*. Between Ruth's and Jessie's.

g. Find the general average of the class.

h. Find the difference between Helen's average and the average of the class.

4. Our outdoor thermometer indicated the following temperatures for the mornings of last week: 76°, 82°, 80°, 67°, 60°,

70°, 81°. The week before the record was 60°, 63°, 58°, 57°, 70°, 68°, 72°. For which week was the average temperature higher, and how much higher was it?

IDEAS OF PROPORTION

Oral

1. 2 is what part of 6? If 6 quarts of beans cost 45 cents, what will 2 quarts cost?

2. 14 is how many times 2? What will 14 pears cost at the rate of 2 for 5 cents?

3. 18 is how many times 3? If a boy is paid 20 cents for 3 hours' work, what should he receive for 18 hours' work?

4. If a boy works 6 days to earn $4, how long should he work to earn $10?

5. What should I receive for 5 weeks' work when I earn $16 in 5 days?

6. One gallon is how many times 1 quart? 10 gallons are how many times 10 quarts? When 10 quarts of milk cost 60 cents, what should be paid for 10 gallons of milk?

7. If 14 five-pound jars of butter will last a family a certain time, how many ten-pound jars would last the same time?

Written

1. 3 is what part of 4? What should a man pay for three acres of land when 4 acres are worth $189?

2. How many bushels of wheat can be raised on 42 acres of land when 159 bushels are raised on 7 acres?

3. How many tons of hay can be bought for $3600 when 17 tons cost $300?

4. How many 10-gallon cans may be filled from a tank of oil that will fill 155 two-gallon cans?

5. Five is how many times three? How far can a man walk in 5 days if he walks at the rate of 67 miles in 3 days?

6. Find the amount of cloth needed for 36 suits when $17\frac{2}{3}$ yd. will make 3 suits.

7. How many 8-quart baskets of peaches would it take to equal in value 5346 bushel baskets of peaches?

REVIEW AND PRACTICE

Oral

1. What is the L. C. M. of 8 and 12?

2. Name two other common multiples of 8 and 12.

3. Which of these numbers are composite: 15, 13, 29, 36, 71, 83, 87, 91, 97, 99?

4. Name two numbers that are prime to each other.

5. Name a number that will exactly contain 13.

6. What is the smallest number that will exactly contain 3, 4, and 6?

7. $\frac{1}{2}$ of $\frac{1}{3} = ?$ $\frac{1}{2}$ and $\frac{1}{3} = ?$ $\frac{1}{2}$ less $\frac{1}{3} = ?$ $\frac{1}{2}$ times $\frac{1}{3} = ?$ $\frac{1}{2} \div \frac{1}{3} = ?$

8. From $\frac{3}{4}$ take $\frac{2}{8}$.

9. A farmer having 60 sheep sold $\frac{1}{4}$ of them at one time and $\frac{1}{5}$ at another. How many had he left?

10. A field of $3\frac{7}{8}$ acres was planted to corn and potatoes. There were $1\frac{3}{4}$ acres of potatoes. How many acres of corn were there?

11. A lady went shopping with \$10. After spending $\$3\frac{3}{4}$ in one store and $\$5\frac{1}{2}$ in another, how much money had she?

12. Change $1\frac{2}{18}$ to a fraction whose terms are prime to each other.

13. Change $4\frac{1}{5}$ to an improper fraction.

14. Find the value of $\frac{2}{5}1$.

15. My mother paid 8 cents for one melon, 7 cents for another, and 10 cents for another. What was the average cost?

16. Show by means of a circle that $\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{6}$.

Written

1. Draw a clock face, using Roman numerals. Let the hands indicate a quarter past 9.

2. Find the wages of 8 men for $5\frac{3}{4}$ days at $\$3\frac{1}{2}$ a day.

3. 15 sheep at $\$2\frac{5}{8}$ apiece will pay for how many yards of cloth at $\$\frac{3}{8}$ per yard?

4. A watch gains $1\frac{1}{2}$ seconds every day. How many minutes does it gain in the months of June and July?

5. There are 609 pupils in a school, $\frac{4}{7}$ of whom are girls. How many boys are there?

6. Divide $\frac{1\frac{1}{2}}{\frac{2}{3}}$ by $\frac{2\frac{2}{6}}{\frac{1}{6}}$.

7. A man spent $\frac{2}{3}$ of his money and had \$60 left. How much had he at first?

8. *a.* $15\frac{3}{8} \times 16\frac{7}{8} = ?$ *b.* $16\frac{2}{3} \div 33\frac{1}{3} = ?$ *c.* $5\frac{3}{8} \div 1\frac{1}{3} = ?$

9. $(2\frac{1}{2} + \frac{6}{7} + 3) \div \frac{3}{5} = ?$

10. If $6\frac{1}{4}$ bushels of rye cost $\$5\frac{3}{4}$, what is the cost of 1 bushel?

11. Change to a simple fraction $\frac{\frac{1}{2} \text{ of } \frac{2}{3}}{6\frac{2}{3}}$.

12. $\$78\frac{5}{8}$ will buy how many barrels of flour at $\$4\frac{5}{8}$ a barrel?

13. Find the value of $\frac{5\frac{3}{4}}{6\frac{1}{2}}$.

14. The area of a wall map is $976\frac{7}{8}$ square inches. Its length is $42\frac{1}{2}$ inches. Find its width.

15. An alley between two houses is $\frac{3}{5}$ of a rod wide and $7\frac{1}{2}$ rods long. How many square rods of land does it contain?

16. *a.* The bunches of bananas hanging in this fruit stand contain respectively 98, 124, 62, and 140 bananas. What is the average number of bananas per bunch?

b. The two smaller bunches are red, and sell at the rate of 2 for 5 cents. What are they all worth?

c. What will the others bring at 15 cents a dozen?

d. If the four bunches were bought at $1.09 per bunch, what will be the entire profit on the sales?

17. Mr. Scotese, the fruit dealer, bought 5 bushels of apples for $3.25. They average 136 apples per bushel. He sells them all at the rate of 4 for 5 cents.

a. What is the cost per bushel?

b. What is received for a bushel?

c. What is the profit on 5 bushels?

18. *a.* He sold a dollar's worth of pears at the rate of 3 for 5 cents. How many pears did he sell?

b. If he should put the pears in baskets, 12 in each basket, and offer them to you at 14 cents a basket, or at the rate of 4 for 5 cents, which offer would you take?

19. *a.* He bought peaches at $1 a basket and sold them at 15 cents a quart. There were 10 quarts in a basket. What was his profit on 5 baskets of peaches?

b. If 9 of these peaches would make a quart, and they were sold at 2 cents apiece, what would be the profit on a basket of peaches?

20. What was his profit on 50 baskets of Delaware grapes bought at $12\frac{1}{2}¢$ a basket and sold at $18¢$ a basket?

21. He bought chestnuts at $4.00 a bushel and sold them at 20 cents a quart. What did he gain on a quart?

22. Spanish shelled peanuts cost him $9.80 a sack, each sack containing 140 pounds. He sold them at 12 cents a pound. What was the profit on a sack?

23. He bought 50 watermelons at 23 cents apiece and sold them at 40 cents each. What was his profit?

24. He paid $8 a hundred for cantaloupes and sold them for 12 cents apiece. How much did he gain on a hundred?

25. John earned $\$6\frac{3}{4}$ one week, $\$8\frac{2}{5}$ the second, and $\$7\frac{1}{2}$ the third. What were his average earnings per week?

26. How many pounds of sugar, at $5\frac{1}{2}$ cents a pound, are equal in value to $6\frac{1}{3}$ dozen eggs, at 15 cents a dozen?

ALIQUOT PARTS

One of the equal parts of a number is an **aliquot part** *of that number; e.g.* 8 oz. is an aliquot part of 16 oz. because 8 oz. is $\frac{1}{2}$ of 16 oz.; $16\frac{2}{3}$ cents is an aliquot part of 100 cents because $16\frac{2}{3}$ cents $= \frac{1}{6}$ of 100 cents.

Find the number of cents in $\$\frac{1}{2}$; $\$\frac{1}{3}$; $\$\frac{1}{4}$; $\$\frac{1}{5}$; $\$\frac{1}{6}$; $\$\frac{1}{7}$; $\$\frac{1}{8}$; $\$\frac{1}{10}$; $\$\frac{1}{12}$; $\$\frac{1}{20}$.

The answers given are all what kind of parts of a dollar?

PARTS OF A DOLLAR

5 cents $= \$\frac{1}{20}$	$33\frac{1}{3}$ cents $= \$\frac{1}{3}$
$6\frac{1}{4}$ cents $= \$\frac{1}{16}$	$37\frac{1}{2}$ cents $= \$\frac{3}{8}$
$8\frac{1}{3}$ cents $= \$\frac{1}{12}$	50 cents $= \$\frac{1}{2}$
10 cents $= \$\frac{1}{10}$	$62\frac{1}{2}$ cents $= \$\frac{5}{8}$
$12\frac{1}{2}$ cents $= \$\frac{1}{8}$	$66\frac{2}{3}$ cents $= \$\frac{2}{3}$
$16\frac{2}{3}$ cents $= \$\frac{1}{6}$	75 cents $= \$\frac{3}{4}$
25 cents $= \$\frac{1}{4}$	$87\frac{1}{2}$ cents $= \$\frac{7}{8}$

Which column in the table gives aliquot parts? This table should be committed to memory like the multiplication table, because its use will shorten many problems, *e.g.* 33 books, at $\$.16\frac{2}{3}$ each, will cost $33 \times \$\frac{1}{6} = \$5\frac{1}{2}$.

Oral

Multiply:

1. $12\frac{1}{2}$ cents by 16
2. $16\frac{2}{3}$ cents by 12
3. 25 cents by 20
4. $33\frac{1}{3}$ cents by 27
5. $6\frac{1}{4}$ cents by 16
6. $8\frac{1}{3}$ cents by 24
7. $37\frac{1}{2}$ cents by 8
8. 50 cents by 15
9. $62\frac{1}{2}$ cents by 8
10. $66\frac{2}{3}$ cents by 9
11. 75 cents by 4
12. $87\frac{1}{2}$ cents by 8

13. What is the cost of:

16 pounds of bacon at $12\frac{1}{2}¢$ a pound?
16 balls at $50¢$ each?
36 yards of ribbon at $33\frac{1}{3}¢$ a yard?
36 pounds of candy at $25¢$ a pound?
8 pounds of tea at $62\frac{1}{2}¢$ a pound?

14. When 4 geographies cost \$3, what is the cost of one? Of 9? Of 11? Of 15? (There is an easier way to find the cost of 20 geographies. What is that way?)

15. At \$.75 apiece, what must be paid for 3 chairs? 4 chairs? 6 chairs? 16 chairs? 40 chairs?

Written

1. What is the cost of:

166 pounds of pork at $12\frac{1}{2}$ cents a pound?
348 pounds of veal at $16\frac{2}{3}$ cents a pound?
265 boxes of strawberries at 25 cents a box?
1215 yards of flannel at $33\frac{1}{3}$ cents a yard?
3580 pounds of honey at 20 cents a pound?
748 pounds of tea at 50 cents a pound?

Divide:

2. \$3 by $33\frac{1}{3}¢$
3. \$5 by $25¢$
4. \$2 by $8\frac{1}{3}¢$
5. \$9 by $12\frac{1}{2}¢$
6. \$1 by $6\frac{1}{4}¢$
7. \$10 by $50¢$
8. \$6 by $33\frac{1}{3}¢$
9. \$4 by $12\frac{1}{2}¢$
10. \$2 by $25¢$

11. \$3 divided by $8\frac{1}{3}¢ = ?$

12. At 25 cents apiece, how many hats can be bought for \$6?

13. At 25 cents a pound, how many pounds of cheese can be bought for \$5?

14. At $16\frac{2}{3}$ cents a dozen, how many dozen eggs can be bought for \$4?

DECIMALS

Each removal of a figure one place to the right affects its value how?

We have used this principle thus far in dealing with integers only; but it holds true also for numbers smaller than one. Thus,

Moving 5 to the right

$$\begin{aligned}
&5000. \\
500. &= 5000. \div 10 \\
50. &= 500. \div 10 \\
5. &= 50. \div 10 \\
.5 &= 5. \div 10 = \tfrac{5}{10} \\
.05 &= .5 \div 10 = \tfrac{5}{100} \\
.005 &= .05 \div 10 = \tfrac{5}{1000} \\
.0005 &= .005 \div 10 = \tfrac{5}{10000}
\end{aligned}$$

Moving all the figures to the right

$$\begin{aligned}
734. &= 7340. \div 10 \\
73.4 &= 734. \div 10 = 73\tfrac{4}{10} \\
7.34 &= 73.4 \div 10 = 7\tfrac{34}{100} \\
.734 &= 7.34 \div 10 = \tfrac{734}{1000}
\end{aligned}$$

Notice that we place the decimal point (.) at the right of units' place. This shows where the integer ends and the fraction begins. The places at the right of the decimal point are called decimal places and are named much like those at the left, thus:

Thousands	Hundreds	Tens	Units	·	Tenths	Hundredths	Thousandths	Ten-thousandths	Hundred-thousandths	Millionths
4	6	3	8	·	7	5	4	9	6	5

.7 is read *seven tenths.*

.75 is read *seventy-five hundredths.*

.754 is read *seven hundred fifty-four thousandths.*

.7549 is read *seven thousand five hundred forty-nine ten-thousandths.*

1. Read .8; .49; .786; .4923; .56249; .387654.

2. Read 500; 50; 5; .5; .05; .005; .0005; .00005.

3. Read .25; .36; .39; .47; .365; .3; .7; .403; .07; .009.

4. How many cents make one dollar? What part of a dollar is one cent? 7 cents? 19 cents? 41 cents? 97 cents?

5. We write 25 cents, $.25, because it is 25 hundredths of a dollar. One dime is 1 tenth of a dollar. How would you write it? Write on the blackboard: 5 dimes; 7 dimes; 8 dimes; 3 dimes.

6. 4321.648 is read 4321 *and* 648 *thousandths.*

Notice that *and* is used between the integer and the fraction.

Read: 6.42; 17.5; 4.23; 583.97; .640; 7.640; 439.018; 9341.215; 68.43; 70.9; 893.047; 903.03; 642.008; 95.249.

7. Read: 3.4; .0034; .987; 2048.017; .00315; 200.02.

8. Write in words on the blackboard: 35.08; 6.5; .084; .6082; 235.235; 64.105; 308.02; 56.081; 30.130.

The product of equal factors is a **power:**

e.g. 4 is a power of 2 because $2 \times 2 = 4$

8 is a power of 2 because $2 \times 2 \times 2 = 8$

81 is a power of 3 because $3 \times 3 \times 3 \times 3 = 81$

100 is a power of 10 because $10 \times 10 = 100$

Name 3 other powers of 10.

A fraction whose denominator is 10 *or a power of* 10 *is a* **decimal fraction**; *e.g.* $\frac{6}{10}$, $\frac{59}{1000}$, .25, .3421. Only decimal fractions can be expressed by use of the decimal point as in the last exercise. When a decimal fraction is thus expressed, how may we tell what the denominator is? Name some decimal fractions not given here.

A number that is composed of an integer and a decimal fraction is called a **mixed decimal**; *e.g.* 2.5; 130.35; 21.007.

A fraction that is expressed by writing the numerator above and the denominator below a line is a **common fraction**; *e.g.* $\frac{2}{3}$, $\frac{5}{8}$, $\frac{7}{9}$, $\frac{13}{16}$, $\frac{8}{10}$.

Change to the decimal form:

1. $\frac{25}{100}$	6. $\frac{384}{1000}$	11. $\frac{25}{1000}$	16. $\frac{9}{10}$
2. $\frac{85}{100}$	7. $\frac{49}{100}$	12. $\frac{11}{100}$	17. $\frac{1}{10}$
3. $\frac{326}{1000}$	8. $\frac{5}{10}$	13. $\frac{9}{100}$	18. $5\frac{40}{100}$
4. $\frac{6}{10}$	9. $\frac{6}{100}$	14. $\frac{500}{1000}$	19. $8\frac{2}{10}$
5. $\frac{16}{100}$	10. $\frac{15}{1000}$	15. $\frac{50}{100}$	20. $64\frac{683}{1000}$

Change to common fractions and read:

21. .36	26. .485	31. 5.6
22. .7	27. .016	32. 5.06
23. .125	28. .16	33. 5.006
24. 12.2	29. .06	34. 5.600
25. 6.25	30. .6	35. 5.060

Write first as common fractions, then as decimals:

36. Four tenths.
37. Seventy-five hundredths.
38. One hundred twenty-five thousandths.
39. Sixteen, and forty-eight hundredths.
40. Six hundredths.
41. Six thousandths.

1. What part of 10 units is 1 unit?

2. What part of 1 ten is 1 unit?

3. What part of 2 hundreds is 2 tens?

4. In the number 555, what is the value of the first 5 at the right? The second 5? The third 5?

5. Upon what does the value of any figure depend?

6. In the number 555, the value of the first 5 is what part of the value of the second 5?

7. In the number 5.5, the value of the right-hand 5 is what part of the value of the left-hand 5?

8. In the decimal .555, what is the value of the first 5 at the right? The second 5? The third 5?

9. Read .6; .17; .105; .006; .05; .225; .3478; .06; .049; .207; .3007.

10. *Read:*

a. .368	*j.* 37.005	*s.* $.42\frac{1}{2}$
b. .894	*k.* 25.2036	*t.* $.69\frac{1}{6}$
c. .5328	*l.* 38.000006	*u.* $.8\frac{1}{3}$
d. .2053	*m.* .498369	*v.* $.637\frac{3}{4}$
e. 25.623	*n.* 4.9836	*w.* $.4378\frac{1}{8}$
f. 7.0063	*o.* 49.836	*x.* $.809\frac{7}{11}$
g. 28.3005	*p.* 498.36	*y.* $.430\frac{7}{10}$
h. .28962	*q.* .000400	*z.* $.6842\frac{1}{3}$
i. 15.605	*r.* .0004	

Write decimally:

1. Eight tenths.
2. 29 hundredths.
3. Six, and 284 thousandths.
4. 4584 ten-thousandths.
5. Twenty-five hundredths.
6. Twenty-five thousandths.

7. Twenty-five ten-thousandths.

8. Twenty-five hundred-thousandths.

9. Twenty-five millionths.

10. 1650, and 464 thousandths.

11. One thousand one, and 36 hundred-thousandths.

12. Sixteen, and six thousandths.

13. Seven hundred eighty-four millionths.

14. Twelve hundred-thousandths.

15. Seventy-five ten-thousandths.

16. Seven hundred five thousandths.

17. Seven hundred, and five thousandths.

18. Four thousand three ten-thousandths.

19. Four thousand, and three ten-thousandths.

20. Twenty-four, and five hundred-thousandths.

21. Seventy-one, and seven hundred-thousandths.

22. Four hundred thirty-five, and four thousandths.

23. Eight thousand three hundred forty-one ten-thousandths.

24. Ninety-nine, and eighty-six thousandths.

25. Seventy-eight, and four thousandths.

26. Nine thousand seven, and two hundred seven ten-thousandths.

27. One, and one hundred thousandths.

28. One thousand one, and one hundred one thousandths.

29. Ten, and ten ten-thousandths.

30. One hundred, and one hundred ten thousandths.

31. One hundred one, and one hundred ten-thousandths.

32. One thousand one ten-thousandths.

ADDITION AND SUBTRACTION OF DECIMALS

Since decimal figures increase in value from right to left, like the figures in whole numbers, we may add and subtract decimals as we add and subtract whole numbers, taking care to write them so that the decimal points are all in a column, thus:

4.375	391.42
.35	165.70316
28.3065	225.71684 *Difference*
351.294	
384.3255 *Sum*	

The vacant places in the addends and in the minuend are treated as if they were occupied by ciphers.

Add:

1.	2.	3.	4.
2.2	3.25	4.5	.004
34.5	7.163	.168	4.1
79.89	15.0032	2.12	16.1563

5. .175 + 1.75 + 17.5 + 175.
6. 145 + 14.5 + 1.45 + .145 + .0145.
7. 3.2 + 14.0063 + .006 + 25.384 + .1.
8. .8 + .446 + 59.3 + 2.575 + 1.0056 + .3.
9. 1.45 + 2.365 + 96 + .96 + 15.863 + 4.3 + .0004.
10. 446 + 44.6 + 37562 + 9 + .8 + .321 + .16.
11. 21.0005 + .3842 + .1 + .005 + 3.6 + .158.
12. 1.0006 + 2001.1 + .003 + 5.5 + 11.1111.
13. 205.07 + 301.2 + 687.9124 + 83.045 + 200.
14. .308 + 308. + 8.09 + 9.0786 + 859.
15. 2378. + 23.50 + .890 + .089 + 1.0886.

1. *Subtract:*

a.	*b.*	*c.*	*d.*
24.3	2.86	4.	2.46
4.5	1.325	1.15	.005

2. $7 - .15$
3. $1 - .004$
4. $13 - 2.1$
5. $3.256 - 1.05$
6. $256.1 - 1.256$
7. $29.325 - 15.14$
8. $3.852 - .125$
9. $1.1111 - .0011$
10. $500 - .05$
11. $25.3894 - 15.005$

12. From twenty-eight, and twenty-five thousandths take fourteen, and twenty-five hundredths.

13. From one tenth take one thousandth.

14. *a.* Which is the greater, fifty thousandths or five hundredths? *b.* Three tenths or three hundred thousandths?

15. Take one thousandth from one thousand.

16. From 5 hundred take 5 hundredths.

Find results:

1. $175 - 30.23$.
2. $.015 + 1.05 + .57 + 5.7 + 1.04 + .0045 + 75.36$.
3. $50.4 - .504$.
4. $25.006 + 200.00008 + 6.00005 + 49.005 + 300.059$.
5. $2.005 + 5.5 + 25.010 - 3.2045$.

6. Find the sum of two hundred forty, and four hundred fifty thousandths; thirty-four, and three hundredths; six hundred four, and six hundred four ten-thousandths; fifty, and five tenths.

7. A boy had two balls of kite string. One contained 145.3025 yards and the other 84.3502 yards. He made a kite string 200.02 yards long. How much string had he left?

8. *Subtract:*

a. 32.854	*c.* 86.2	*e.* 21.101
9.378	43.948	7.999
b. 19.042	*d.* 36.015	*f.* 28.78
16.854	24.008	21.987

9. There are four villages on the same road. From the first to the second is 8.46 miles; from the second to the third, 10.5 miles; from the first to the fourth, 25 miles. Make a picture of the road and find the distance from the third to the fourth village.

MULTIPLYING AND DIVIDING BY MULTIPLES OF TEN

Oral

1. How can we multiply decimals by 10? By 100? By 1000?

2. *Multiply by* 10:

5.25; .06; 3.7; 593.207; 6.800; 9.16; 82; 420; .035; .0061.

3. *Multiply by* 100:

61.843; 3.215; 75.16; 3.18; .65; 2.3; 5; 520.

4. Multiply .0612 by 10; by 100; by 1000; by 10,000; by 100,000; by 1,000,000.

5. By what must .0503 be multiplied to obtain .503? 503.? 50.3? 5030.?

6. Moving the decimal point one place to the left is the same as moving all the figures of the number one place to the right. For example, moving the decimal point one place to the left in the number 42.3, it becomes 4.23. How does this affect the value of the number?

7. What, then, is the easiest way to divide a decimal by 10?

8. *Divide by* 10:

35.; 247.; 385.; 16.; 24.3; 2.59; 347.69; 8.137; 42.69; 394.68; .725; .042.

9. How may we divide decimals by 100? By 1000? By 10,000?

10. *Divide by* 100:

3567.8; 937.; 635.25; 42304.; 687.96; 485.03.

11. *Divide by* 1000:

986; 5321; 63,485; 983.7; 4284.25.

12. *Divide by* 10,000:

389,076; 42,831; 68,379.5; 425.

13. By what must 8193 be divided to obtain 819.3? 8.193? 81.93? .8193? .08193? .008193?

14. How must the decimal point be moved to change tenths to hundredths? Thousandths to tenths? Thousandths to millionths?

15. *Divide as follows:*

64.2 by 10; 83.75 by 10; 63.59 by 100; 4251 by 10,000; 33 by 1000; 5 by 100.

16. What is the effect of moving the decimal point three places to the left? One place? Two places? Four places? Six places?

17. *Find results:*

3.5×10; $6.5 \div 10$; $83 \div 1000$; $.987 \div 10{,}000$; $.8432 \times 100{,}000$.

18. What is the effect of moving the decimal point to the left one place? To the right two places? To the left four places? To the right six places?

19. How may we multiply a decimal by 10,000? Divide a decimal by 1000? Multiply a decimal by 100,000?

MULTIPLICATION OF DECIMALS

Multiply 6.41 by 3.2.

$6.41 = 641 \div 100$

$3.2 = 32 \div 10$

$6.41 \times 3.2 = 641 \times 32 \div 100 \div 10$

641	6.41
32	3.2
1282	1282
1923	1923
20512 = 641 × 32	20.512 = 641 × 32 ÷ 100 ÷ 10

How did we divide by 100 and by 10?

From this we see that *to multiply decimals we multiply the factors as whole numbers and point off in the product as many decimal places as there are in both factors;*

e.g. 2.8	1.25	.005	25
8	.6	.03	.06
22.4	.750	.00015	1.50

Find the products:

1. .18 × .15
2. 1.0005 × .2
3. 2.5 × .06
4. 56 × .005
5. .005 × 1.6
6. 25.05 × 1.15
7. 2.863 × 100
8. 13.3 × 1.3
9. 100 × .01
10. 100.56 × .0005
11. 25.32 × 1.05
12. 2.84 × .25
13. 3.28 × 1.125
14. 1.111 × 1000

Oral

1. One of the factors has two decimal places and the other has five. How many decimal places has the product?

2. When there are five decimal places in one factor and one in the other, how many are there in the product?

3. When there are eight decimal places in the product and five in one factor, how many are there in the other factor? When there are six in the product and four in one factor? Five in the product and three in one factor?

DIVISION OF DECIMALS

Divide 10.96516 by 4.67.

```
      2.348   Quotient
4.67)10.96·516
      934
      ----
      1625
      1401
      ----
       2241
       1868
       ----
        3736
        3736
        ----
```

We first divide as in whole numbers. Since the dividend is a product and the divisor one of its factors, the other factor, or quotient, contains as many decimal places as the number of decimal places in the dividend, less the number of decimal places in the divisor.

Mistakes may be avoided by observing the following

RULE FOR PLACING THE DECIMAL POINT

When the divisor is an integer, place the decimal point in the quotient directly over the decimal point in the dividend (or under in short division).

When the divisor contains decimal places, make a dot on a line with the tops of the figures as many places at the right of the decimal point in the dividend as there are decimal places in the divisor. Place the decimal point in the quotient directly above this dot (or below in short division).

NOTE 1. If there is a remainder after all the figures of the dividend have been used, we annex ciphers to the dividend, and continue the division until there is no remainder, or until a sufficient number of decimal places have been obtained in the quotient.

NOTE 2. When the dividend contains fewer decimal places than the divisor, we annex ciphers to the dividend until it has as many decimal places as the divisor.

Written

Find the quotients and test by multiplication:

1. $60.8 \div 1.6$
2. $.00075 \div .05$
3. $25.50 \div .34$
4. $15.2 \div 3.04$
5. $.27560 \div 265$
6. $90.978 \div 3.54$
7. $38.4444 \div 177$
8. $14.4 \div .0018$
9. $1.127 \div 4.9$
10. $.9156 \div 12$
11. $315.432 \div .48$
12. $1.5906 \div .6$
13. $375 \div .125$
14. $125 \div .125$
15. $1000 \div .001$
16. $.001 \div 1000$
17. $25 \div .25$
18. $.25 \div 25$
19. $18.65 \div 100$
20. $266.4 \div .036$
21. $2.107 \div .35$
22. $.100854 \div 3.879$
23. $125874. \div .486$
24. $9801. \div .99$
25. $2976. \div 4.96$
26. $164.32 \div .208$
27. $347.76 \div .368$
28. $.0006478 \div .079$
29. $2.5826 \div 69.8$
30. $98.07 \div .210$
31. $20.852 \div .52$
32. $.0023322 \div .0026$
33. $676.8 \div .08$
34. $1273.998 \div .199$
35. $357.6 \div 2.98$
36. $.75897 \div 810$

Find the products and test by division:

1. 3.2×3.6
2. $86 \times .09$
3. $9.8 \times .005$
4. $.039 \times 57$
5. $.00356 \times 6.8$
6. $6394. \times .029$
7. $864. \times .278$
8. $.00967 \times 240$
9. $839.42 \times .0015$
10. 208.7×30.9
11. 930×6.80
12. $4203 \times .0076$
13. $69 \times .00035$
14. $406 \times .000039$
15. 7.92×1.002
16. $7.0001 \times .0603$
17. $43.55 \times .06$
18. $2354 \times .008$
19. 39.04×2.08
20. 6.80×86732
21. $2400. \times .387$
22. $.0406 \times 3080$
23. 920×63.7
24. $.992 \times 3001$
25. $2460 \times .0039$
26. $1234. \times .56$
27. $9.924 \times .0106$
28. $.0204 \times 20.40$
29. $78.08 \times .025$
30. $.8060 \times 300$

Oral

$.7 = \frac{7}{10}$, or 7 divided by 10.

$.305 = \frac{305}{1000}$, or 305 divided by 1000.

$.58\frac{1}{3} = \frac{58\frac{1}{3}}{100}$, or $58\frac{1}{3}$ divided by 100.

In like manner tell the meanings of the following decimals:

1. .8
2. .416
3. .21
4. .3879
5. .200
6. $.89\frac{1}{2}$
7. $.6\frac{5}{9}$
8. $.39\frac{2}{3}$
9. $.48\frac{6}{11}$
10. $.873\frac{1}{2}$
11. $.029\frac{1}{8}$
12. $.007\frac{2}{13}$
13. $.103\frac{2}{3}$
14. $.2134\frac{5}{8}$
15. $.4070\frac{1}{8}$
16. $.05\frac{1}{2}$
17. .034
18. .0165
19. $.000171\frac{1}{2}$
20. $.000\frac{3}{7}$

CHANGING DECIMALS TO COMMON FRACTIONS OR MIXED NUMBERS

$$.072 = \tfrac{72}{1000} = \tfrac{9}{125}$$

$$18.25 = 18\tfrac{25}{100} = 18\tfrac{1}{4}$$

Reduce to common fractions or mixed numbers in simplest form:

1. .8	8. .125	15. 16.75
2. .25	9. .875	16. .00125
3. .35	10. .375	17. .054
4. .75	11. .455	18. .0250
5. .64	12. .025	19. .01375
6. .52	13. .561	20. $.34\frac{2}{7}$
7. .38	14. .368	

Solution: $.34\frac{2}{7} = 34\frac{2}{7} \div 100 = \frac{\overset{12}{\cancel{240}}}{7} \times \frac{1}{\underset{5}{\cancel{100}}} = \frac{12}{35}$ *Ans.*

21. $.12\frac{1}{2}$	31. $2.33\frac{1}{3}$	41. $.166\frac{2}{3}$
22. $.62\frac{1}{2}$	32. $.3\frac{1}{7}$	42. $.19\frac{7}{12}$
23. $.06\frac{1}{4}$	33. $42.62\frac{1}{2}$	43. $.562\frac{1}{2}$
24. $.18\frac{1}{8}$	34. $97.087\frac{1}{2}$	44. $400.40\frac{5}{7}$
25. $.03\frac{3}{4}$	35. $56.13\frac{1}{3}$	45. $361.41\frac{1}{9}$
26. $.25\frac{4}{5}$	36. $158.06\frac{1}{4}$	46. $2042.1\frac{5}{6}$
27. $.87\frac{1}{2}$	37. $409.6\frac{7}{8}$	47. $79.00\frac{5}{9}$
28. $.66\frac{2}{3}$	38. $.07\frac{3}{11}$	48. $308.00\frac{25}{36}$
29. $.36\frac{7}{8}$	39. $.26\frac{2}{3}$	49. $2890.90\frac{4}{9}$
30. 16.25	40. $.012\frac{6}{7}$	50. $98.000\frac{40}{41}$

Oral

Using aliquot parts, reduce the following to mixed numbers:

1. \$58.50	6. \$6.05	11. $15.08\frac{1}{3}$
2. $\$39.33\frac{1}{3}$	7. $\$32.12\frac{1}{2}$	12. $422.33\frac{1}{3}$
3. $\$5.16\frac{2}{3}$	8. \$19.10	13. $100.14\frac{2}{7}$
4. \$7.25	9. $\$18.14\frac{2}{7}$	14. $603.16\frac{2}{3}$
5. \$19.20	10. 16.02	15. 99.02

At sight, reduce the following to common fractions or mixed numbers:

1. $.62\frac{1}{2}$	4. 12.875	7. $29.87\frac{1}{2}$	10. 43.4
2. $.66\frac{2}{3}$	5. 13.02	8. 3.6	11. $12.37\frac{1}{2}$
3. .75	6. 430.625	9. 7.8	12. 54.375

REDUCTION OF COMMON FRACTIONS AND MIXED NUMBERS TO DECIMALS

Written

Change $\frac{5}{16}$ to a decimal.

$$
\begin{array}{r}
.3125 \\
16\overline{)5.0000} \\
48 \\
\hline
20 \\
16 \\
\hline
40 \\
32 \\
\hline
80 \\
80 \\
\hline
\end{array}
$$

$\frac{5}{16} = 5 \div 16 = .3125$ *Ans.*

Write $9\frac{5}{16}$ as a mixed decimal.

Reduce to decimals:

1. $\frac{4}{5}$	11. $\frac{12}{40}$	21. $\frac{47}{64}$	31. $19\frac{19}{125}$
2. $\frac{3}{4}$	12. $\frac{9}{16}$	22. $\frac{38}{64}$	32. $\frac{1}{625}$
3. $\frac{4}{25}$	13. $\frac{1}{8}$	23. $\frac{43}{80}$	33. $\frac{7}{125}$
4. $\frac{7}{8}$	14. $\frac{56}{25}$	24. $\frac{17}{20}$	34. $12\frac{6}{625}$
5. $\frac{3}{20}$	15. $3\frac{1}{16}$	25. $13\frac{7}{20}$	35. $14\frac{29}{80}$
6. $\frac{2}{5}$	16. $\frac{3}{8}$	26. $19\frac{7}{16}$	36. $9\frac{9}{125}$
7. $\frac{3}{5}$	17. $\frac{3}{80}$	27. $12\frac{9}{25}$	37. $13\frac{1}{40}$
8. $\frac{5}{32}$	18. $\frac{8}{25}$	28. $\frac{11}{50}$	38. $2\frac{21}{250}$
9. $\frac{7}{16}$	19. $\frac{15}{20}$	29. $\frac{23}{40}$	39. $5\frac{8}{32}$
10. $\frac{54}{36}$	20. $2\frac{3}{32}$	30. $\frac{87}{125}$	40. $\frac{23}{320}$

A fraction in lowest terms whose denominator contains other prime factors than 2 and 5 cannot be reduced to an exact entire decimal; e.g. $\frac{2}{3}$, $\frac{5}{9}$, $\frac{15}{22}$, $\frac{8}{11}$, $\frac{19}{26}$, $\frac{41}{35}$.

Such a fraction may be reduced to a decimal of nearly the same value by carrying the division to a certain number of decimal places, thus:

Reduce $\frac{19}{26}$ to a decimal of four places.

$.7307\frac{9}{13}$ *Ans.*

26.)19.0000

182

80

78

200

182

18

$\frac{18}{26} = \frac{9}{13}$

.7307 is almost equal to $\frac{19}{26}$.

The exact value of $\frac{19}{26}$ is $.7307\frac{9}{13}$.

The result may be expressed, .7307+.

Written

Reduce to decimals of three places:

1. $\frac{1}{3}$	7. $\frac{14}{31}$	13. $8\frac{7}{15}$	19. $42\frac{10}{29}$
2. $\frac{5}{7}$	8. $\frac{5}{48}$	14. $23\frac{1}{9}$	20. $\frac{236}{358}$
3. $\frac{2}{11}$	9. $\frac{12}{17}$	15. $681\frac{4}{11}$	21. $\frac{85}{275}$
4. $\frac{5}{6}$	10. $\frac{143}{19}$	16. $3\frac{8}{17}$	22. $43\frac{5}{42}$
5. $\frac{4}{7}$	11. $\frac{1}{240}$	17. $\frac{23}{23}$	23. $16\frac{9}{71}$
6. $\frac{8}{13}$	12. $15\frac{2}{9}$	18. $\frac{50}{61}$	24. $\frac{256}{301}$

A COMMON FRACTION AT THE END OF A DECIMAL

$.2\frac{1}{2} = .2 + (\frac{1}{2}$ of $\frac{1}{10}$, or $\frac{1}{20}$, or $.05)$.

$.2 + .05 = .25$.

In a similar manner, we may show that,

$.27\frac{1}{2} = .275$, $.384\frac{1}{2} = .3845$, etc.

Also, that $.2\frac{1}{4} = .225$, $.34\frac{1}{4} = .3425$, etc.

Also, that $.8\frac{3}{4} = .875$, $.06\frac{3}{4} = .0675$, etc.

Also, that $.9\frac{1}{8} = .9125$, $.07\frac{3}{8} = .07375$, etc.

Oral

Express as entire decimals:

1. *a.* $.2\frac{1}{2}$	*b.* $\$.17\frac{1}{2}$	*c.* $.360\frac{1}{2}$	*d.* $7\frac{1}{2}$	*e.* $.004\frac{1}{2}$
2. *a.* $.8\frac{1}{4}$	*b.* $3.7\frac{1}{4}$	*c.* $\$9.20\frac{1}{4}$	*d.* $\$.39\frac{1}{4}$	*e.* $.145\frac{1}{4}$
3. *a.* $.05\frac{3}{4}$	*b.* $1.1\frac{3}{4}$	*c.* $\$21.46\frac{3}{4}$	*d.* $.033\frac{3}{4}$	*e.* $.090\frac{3}{4}$
4. *a.* $.7\frac{1}{4}$	*b.* $6.8\frac{1}{2}$	*c.* $80.3\frac{1}{2}$	*d.* $12\frac{3}{4}$	*e.* $1.9\frac{1}{4}$
5. *a.* $42\frac{1}{2}$	*b.* $3.97\frac{1}{2}$	*c.* $150\frac{3}{4}$	*d.* $24.0\frac{1}{2}$	*e.* $29.0\frac{1}{4}$
6. *a.* $1.30\frac{3}{4}$	*b.* $2.45\frac{3}{4}$	*c.* $100\frac{1}{2}$	*d.* $20\frac{3}{4}$	*e.* $40.00\frac{1}{2}$

ACCOUNTS AND BILLS

When your mother sends you to the store, where she is accustomed to buy groceries, giving you no money, and tells you to buy certain articles and have them charged, what does she mean?

The merchant has a book in which he keeps the names of persons to whom he sells things not paid for at the time of the sale, together with a list of the articles sold, their value, and the date of sale. This list is called an **account.**

The person who sells the goods is the **creditor,** and the person who buys the goods is the **debtor.** The debtor and creditor are called **parties** to the account.

A doctor keeps a record of the calls that he makes or receives in treating his patients, when the calls are not paid for at the time. This record is called the patient's account. Who is the creditor? Who is the debtor?

If your father works for some one, he keeps an account of his time and wages. Which party is your father? Which party is the man for whom he works?

At certain times, the creditor copies on a piece of paper a statement of the debtor's account and sends it to the debtor. This statement is called a **bill.**

There are various ways of writing a bill, but it should always contain these things:

1. The time and place of making out the bill. This is called the date of the bill.
2. The debtor's name and address.
3. The creditor's name and address.
4. A list of the items — that is, the goods sold, money paid or services rendered, with the amount of each item.
5. The date of each transaction.
6. The amount, or footing, of the bill.

(Form 1)

SYRACUSE, N.Y., June 20, 1912.

MR. JOHN P. SMITH,

713 McBride St.,

Bought of ANDREWS BROTHERS,

cor. James and Warren Sts.

2 bu. Apples	$1.10	$2	20
10 lb. Granulated Sugar	.05½		55
½ lb. Tea	.50		25
		$3	00

What is the date of this bill? Read the items.

Who is the creditor? The debtor?

What is the amount of the bill?

Who ought to pay the bill?

Who should receive the money?

When a bill is paid, the creditor "receipts" the bill by writing at the bottom, "Received Payment," followed by the date and his own name. This shows that the bill has been paid. The debtor keeps the receipted bill to show that the debt has been paid.

When the above bill is paid, who should receipt it?

Make a bill similar to the one given above, but using different items. Find its amount, and receipt it.

Sometimes a clerk, an agent, or a bookkeeper of the creditor receives the money for payment of a bill. He should then write the creditor's name under the words "Received Payment," and under the creditor's name, his own name or initials, thus:

Received Payment,

July 1, 1912.

ANDREWS BROTHERS,

Per KATE L. BUNN.

Receipt the bill in Form 1 as though you were a clerk for the creditor.

(Form 2)

SPOKANE, WASH.
April 1, 1913.

MR. W. C. FLINT,
1213 Maxwell Ave.,

To CARROLL SMITH, M.D., *Dr.*
Traders' Building.

To professional services rendered, Feb. 25 to March 18, 1913,	$37	50
Received Payment, April 16, 1913. CARROLL SMITH.		

Name each of the parties in this bill. Has the bill been paid? How do you know?

Make out bills of the following items, the teacher being the debtor in each one, and yourself the creditor. Let the teacher examine each bill, and mark it O.K. if correctly made. Receipt the bill and return it to the teacher.

1. 3 bu. potatoes at 75¢ per bushel.
   8 lb. lard at 15¢ per pound.
   5 gal. kerosene oil at 12¢ per gallon.

2. 4 lb. coffee at 25¢ per pound.
   18 lb. sugar at $5\frac{1}{2}$¢ per pound.
   5 gal. molasses at 60¢ per gallon.

3. 6 bbl. potatoes at $1.80 per barrel.
   2 tons hay at $16 per ton.
   3 cords wood at $4 per cord.

Make many bills and foot them.

REVIEW AND PRACTICE

Oral

1. *Read:*

.0305; 42.0042; 4.0004; 6.395; .0600; 639.500; 639.00005; 10.10; $36\frac{3}{8}$; $50.00\frac{5}{9}$.

2. *Express as common fractions in lowest terms:*

.5; .25; .75; $.12\frac{1}{2}$; $.37\frac{1}{2}$; $.87\frac{1}{2}$; $.16\frac{2}{3}$; $.33\frac{1}{3}$; $.62\frac{1}{2}$; $.66\frac{2}{3}$; $.08\frac{1}{3}$; .02.

3. *Divide by* 10:

62; 93.5; 3.44; .25; .0081; .0384; 1.027.

4. *Multiply by* 1000:

8.934; .0245; .612356; 48; 63.05.

5. *Give results:*

436×100; $436 \div 1000$; 436×10; $5 \div 100$; $8314 \div 10{,}000$; $6.183 \times 10{,}000$.

6. *Express as common fractions in lowest terms:*

.4; .60; .8; .500; .70; .200; .600.

7. How may decimals be divided by 10? by 100? by 10,000? by 1,000,000? by 1000?

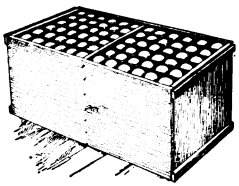
8. A stamp clerk received \$4085 for special delivery stamps at 10 cents apiece. How many such stamps did he sell?

9. Compare $\$\frac{1}{4}$ with $\$\frac{1}{8}$; $\$\frac{3}{4}$ with $\$\frac{3}{8}$.

10. Compare 1 bushel with $\frac{1}{9}$ of a bushel; 5 bushels with $\frac{5}{9}$ of a bushel.

11. What will 3 months' rent cost at \$240 a year?

12. What will a dozen cabbages cost at the rate of 3 for 25¢?



13. *a.* Count the eggs in the top layer of this crate. How many dozen are there?

b. How many such layers are there if the crate contains 30 dozen?

c. $\frac{4}{5}$ of them are how many dozen? How many eggs?

d. $\frac{1}{2}$ of one layer is what fraction of the entire number?

e. How many pounds will a dozen eggs weigh if their average weight is 2 oz. apiece?

f. What is the entire weight of the eggs in the crate?

14. If $\frac{3}{4}$ of a yard of cloth costs 50 cents, what will 3 yards cost? (3 yd. are how many times $\frac{3}{4}$ yd?)

15. If I borrow one dollar, and agree to pay it back in one year, with 6 cents more to pay for the use of it, how much must I pay in all, at the end of the year?

16. If you lend me \$8 for a year, and I agree to pay five cents for the use of each dollar, how much will I owe you at the end of the year?

How much will I owe if I agree to pay $5\frac{1}{2}$ cents for the use of each dollar? 7 cents? 8 cents? $4\frac{1}{2}$ cents? $6\frac{1}{2}$ cents? 9 cents?

17. What must I pay for the use of \$20 for one year, if I pay 5 cents for the use of each dollar?

If I keep the money three years, paying each year for the use of it, and then pay back the \$20 which I borrowed, how much will I have paid in all?

18. Mr. A borrowed 9 dollars from Mr. B. After four years he paid it back and also paid 5 cents a year for the use of each dollar. How much did Mr. A pay to Mr. B?

19. A man borrowed \$10 from me and agreed to pay me for the use of it at the rate of 6 cents a year for each dollar. He kept the money only half a year. How much should he pay me for the use of the money?

How much should he pay me in all?

20. How much should be paid for the use of twenty dollars for one and one half years at the rate of 5 cents a year for every dollar?

21. A man paid \$5 a year for the use of \$100. How much a year would he pay for the use of \$500 at the same rate?

22. If \$7 is paid for the use of a sum of money for 2 years, what should be paid for the use of the same sum for 6 years?

23. A woman who lives near the grocery takes her lamp to the grocery to be filled and pays 5 cents every time. The lamp holds a pint of oil.

a. How much per gallon does the oil cost her?

b. If the lamp burns one pint of oil in two days, in how many days will it consume one gallon of oil?

c. In how many days will it consume four gallons?

d. How much would she save by buying four gallons of oil at $12\frac{1}{2}$¢ a gallon?

24. Margaret's mother buys $\frac{1}{2}$ lb. of sliced bacon twice a week at 23¢ per pound.

a. How much does she pay each time?

b. How much does she pay for bacon in six weeks?

c. How much would a 6-pound piece of bacon cost at 20¢ a pound?

d. How much would Margaret's mother save by buying such a piece at that price?

25. What will 20 quarts of berries cost at the rate of 2 quarts for 25¢?

Written

1. Express as common fractions in simplest form: *a.* .125; *b.* .625; *c.* .025; *d.* .5625; *e.* .087500; *f.* Five hundred five thousandths.

2. Express as exact decimals:

a. $\frac{7}{8}$; *b.* $1\frac{19}{20}$; *c.* $\frac{7}{16}$; *d.* $\frac{3}{250}$; *e.* $6\frac{5}{64}$; *f.* $\frac{18}{125}$.

3. Reduce to decimals of four places:

$\frac{1}{3}$; $\frac{37}{111}$; $\frac{115}{120}$; $\frac{24}{175}$; $\frac{65}{91}$; $\frac{14}{29}$.

4. *Express in figures and add:* Six and forty-five thousandths; forty-nine and seven hundred seventy-nine thousandths; twenty-four thousand nine hundred, and five hundredths; six hundred five thousandths; three hundred forty-three hundred-thousandths; seventy-nine and five tenths; eleven and thirty-nine hundredths; eight hundred twenty-five, and forty-five hundredths; nine hundred fifteen, and six tenths.

5. From fifteen and twenty-five thousandths take five and six hundred twenty-five millionths. Express the result in words.

6. Find the sum of 3.7; 36.05; .085; 35.25.

7. From .8 take eight thousandths.

8. Find the sum of .0375, $24\frac{1}{6}$, 43.8, and $7\frac{4}{5}$.

9. Find the cost of 6.5 barrels of flour at $5.75 a barrel.

10. What number divided by $17\frac{3}{8}$ will give 5.05?

11. Add 36.048, 25.13, $13\frac{5}{8}$, and $25\frac{3}{5}$.

12. Find the sum of $\frac{5}{8}$ and .375.

13. A liveryman bought 10.5 tons of hay at $10.375 a ton. What did it cost?

14. At $60.75 an acre, what is the cost of 40.25 acres of land?

15. A lady purchased 4.5 yd. of silk at \$1.25 per yard and 7.25 yd. of broadcloth at \$3.50 per yard. What change should she receive from a \$20 bill and two \$10 bills?

16. A farmer divided his farm of 168.8 acres into 16 equal fields. How much land was there in each field?

17. Divide 53.66523 by .941.

18. $28.8 \div .0072 = ?$

19. Divide .305996 by .337.

20. Divide 990 by .11.

21. \$87.50 will pay for how many piano lessons at \$1.25 a lesson?

22. $207.09 \div .015 = ?$

23. A boy's height increased 1.4 inches in his 12th year, 1.5 inches in his 13th year, and 1.6 inches in his 14th year. What was his average growth per year for the three years?

24. A farmer received \$146¼ for pigs at \$3¼ apiece. How many pigs did he sell?

25. The smaller of two numbers is 9346.05. Their difference is 412.08. What is the greater?

26. $9.2 \times 5.37 - (1.785 + .1318) = ?$

27. The following quantities of stamps were sold during a year at a city post office. Find what was received for all of them:

1-cent . . .	4,832,500	6-cent . . .	40,000
2-cent . . .	10,550,000	8-cent . . .	47,100
3-cent . . .	117,500	10-cent . . .	70,200
4-cent . . .	161,000	13-cent . . .	3400
5-cent . . .	198,000	15-cent . . .	8800

PART OF AN AMERICAN WAR FLEET

Battleships

NAME	LENGTH	TONNAGE	NO. OF GUNS	SPEED IN KNOTS PER HOUR	MEN
Arkansas . . .	562 ft.	27243	43	20.50	1115
Connecticut . .	456 ft.	17666	54	18.78	994
Delaware . . .	518 ft.	22000	34	21.	917
Florida	521 ft.	23033	36	20.75	1014
Louisiana . . .	450 ft.	17666	74	18.82	942
Kansas	456 ft.	17658	62	18.09	942
Michigan . . .	452 ft.	17617	46	18.79	803
Minnesota . . .	456 ft.	17650	62	18.85	967
New Hampshire	456 ft.	17784	54	18.16	942
South Carolina	452 ft.	17617	46	18.86	803
Utah	521 ft.	23033	36	20.75	1014
Iowa	360 ft.	12445	48	17.1	654

Armored Cruisers

Montana	504 ft.	15981	54	22.26	950
North Carolina	504 ft.	15981	54	22.48	950
Tennessee . . .	504 ft.	14500	48	22.16	971
Washington . .	504 ft.	15712	62	22.27	946

28. *a.* If all these ships were formed in a single unbroken line, how many feet long would the line be?

b. How many miles long would it be?

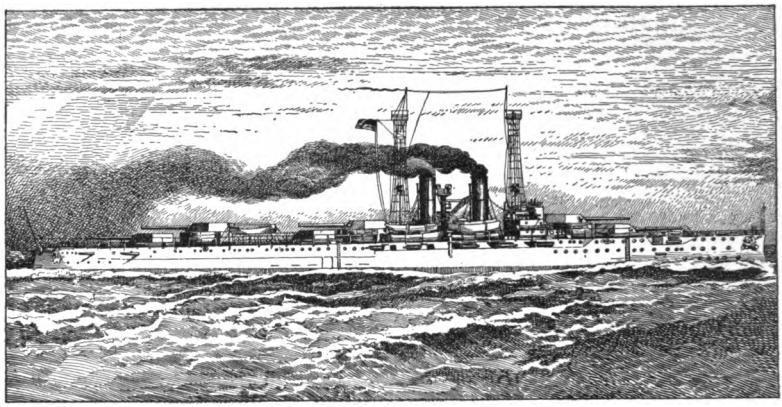
c. What is the average tonnage?

d. How many guns do they all carry?

e. How many men are there on all the ships?

f. How many knots greater is the average speed of the cruisers than of the battleships?

g. What is the average number of men on a ship?



THE BATTLESHIP ARKANSAS

29. A knot, or nautical mile, is used in measuring the speed of vessels. It is equal to about 1.15 common or statute miles.

a. The *Connecticut's* speed is how many common miles per hour?

b. The *Florida's* speed per hour is how many common miles greater than the *Connecticut's?*

30. *a.* A knot is 6080.27 ft. How many feet farther can the cruiser *Montana* sail in an hour than the battleship *New Hampshire?*

b. If the *New Hampshire* is 9.9 knots ahead of the *Montana*, and both are moving at highest speed, in how many hours can the *Montana* overtake the *New Hampshire?*

31. How many common miles can the *South Carolina* go in 24 hours, if she goes 18.86 knots per hour all the time?

32. How many feet can the *Tennessee* go in 1 minute?

Make other problems about these warships, using the numbers given in the table.

33. What is the cost of 8.2 bales of cotton, each bale weighing 412.6 lb. at $\$\frac{1}{8}$ a pound?

34. Two motor cars start from the same place at the same time and go in opposite directions, one at the rate of 12.325 miles an hour, and the other at the rate of 14.875 miles an hour. How far apart are they at the end of $10\frac{1}{4}$ hours?

35. *a.* What must be paid for the use of $225 for one year at the rate of 6 cents a year for the use of one dollar? *b.* For two years? *c.* For $3\frac{1}{2}$ years?

36. Mr. Scott borrowed $1500 from Mr. Moore and agreed to pay it back in two years, and also to pay Mr. Moore for the use of it at the rate of 5 cents a year for every dollar. *a.* How much did Mr. Scott have to pay for the use of the money?

b. How much did he have to pay in all?

37. If I pay 42 dollars for the use of $600 for a year, how much do I pay for the use of one dollar?

38. Find how much I will pay in $2\frac{1}{2}$ years for the use of $2000 if I pay $4\frac{1}{2}$ cents each year for the use of every dollar.

39. Mr. Marvin borrowed $3500 and paid it five years afterward. He also paid 4 cents each year on every dollar he owed. How much did he pay in all?

40. If I pay at the rate of 7 cents a year for the use of one dollar, how much must I pay for the use of $2800 for six months? (Six months are what part of a year?)

41. *a.* If 5 cents will pay for the use of one dollar for a year, $24 will pay for the use of how many dollars for a year?

b. At the rate of 6 cents a year for the use of a dollar, $24 will pay for the use of how many dollars for a year?

42. A barrel of flour weighs 196 lb. Flour costing \$5 a barrel is made into bread containing $11\frac{1}{5}$ oz. of flour to a loaf. Some of the bread is bought by Mrs. X at 5¢ a loaf.

a. How many loaves of bread are made from a barrel of flour?

b. How much does it bring at 5¢ a loaf?

c. How much would Mrs. X save by buying a barrel of flour and making her bread, supposing that the yeast costs 50¢ and the extra coal 80¢?

43. Make bills of the following items, making the Grote-Rankin Co. creditor and your teacher the debtor. Receipt the bills as though you were agent for the creditor.

a. 16 yd. silk at \$1.50 per yard.
4 pairs hose at 50¢ per pair.
9 yd. lace at 60¢ per yard.

b. 1 chocolate pot, 75¢.
6 salad plates at \$1.10 each.
15 Haviland bouillon cups at \$12 per doz.
1 bread plate, 98¢.

44. Divide $\frac{3}{15}$ of $\frac{9}{11}$ by $3\frac{2}{3}$ times $1\frac{7}{11}$.

45. Divide $\frac{3}{5}$ of $\frac{5}{7}$ of $\frac{4}{9} \times 3\frac{1}{4}$ by $\frac{5}{8}$ of $\frac{12}{25}$ of $\frac{4}{9}$.

46. Solve in the easiest way:

a. If 6 acres of land cost \$438, what will 42 acres cost?

b. How many loads of earth can be bought for \$80 when \$400 will buy 1135 loads?

47. $\frac{7}{19}$ is how many times $\frac{2}{21}$?

48. *a.* If a loaf of bread $11\frac{1}{4}$ inches long is cut into slices $\frac{5}{8}$ inches thick, how many slices are there?

b. If the bread costs 5¢ a loaf and all except the crusts is served at a lunch counter at 1¢ a slice, what is the profit on 90 loaves?

c. The 90 loaves would make how many slices $\frac{8}{8}$ inches thick?

LIQUID MEASURE

4 gills (gi.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

DRY MEASURE

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

UNITED STATES MONEY

10 mills = 1 cent
10 cents = 1 dime
10 dimes = 1 dollar
10 dollars = 1 eagle

AVOIRDUPOIS WEIGHT

16 ounces (oz.) = 1 pound (lb.)
2000 pounds = 1 ton (T.)
100 pounds = 1 hundredweight (cwt.)

LINEAR MEASURE

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
$5\frac{1}{2}$ yards or $16\frac{1}{2}$ feet = 1 rod (rd.)
320 rods = 1 mile (mi.)

TIME

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
365 days = 1 common year
366 days = 1 leap year

SQUARE MEASURE

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)

2 × 1 = 2	3 × 1 = 3	4 × 1 = 4	5 × 1 = 5
2 × 2 = 4	3 × 2 = 6	4 × 2 = 8	5 × 2 = 10
2 × 3 = 6	3 × 3 = 9	4 × 3 = 12	5 × 3 = 15
2 × 4 = 8	3 × 4 = 12	4 × 4 = 16	5 × 4 = 20
2 × 5 = 10	3 × 5 = 15	4 × 5 = 20	5 × 5 = 25
2 × 6 = 12	3 × 6 = 18	4 × 6 = 24	5 × 6 = 30
2 × 7 = 14	3 × 7 = 21	4 × 7 = 28	5 × 7 = 35
2 × 8 = 16	3 × 8 = 24	4 × 8 = 32	5 × 8 = 40
2 × 9 = 18	3 × 9 = 27	4 × 9 = 36	5 × 9 = 45
2 × 10 = 20	3 × 10 = 30	4 × 10 = 40	5 × 10 = 50
2 × 11 = 22	3 × 11 = 33	4 × 11 = 44	5 × 11 = 55
2 × 12 = 24	3 × 12 = 36	4 × 12 = 48	5 × 12 = 60

6 × 1 = 6	7 × 1 = 7	8 × 1 = 8	9 × 1 = 9
6 × 2 = 12	7 × 2 = 14	8 × 2 = 16	9 × 2 = 18
6 × 3 = 18	7 × 3 = 21	8 × 3 = 24	9 × 3 = 27
6 × 4 = 24	7 × 4 = 28	8 × 4 = 32	9 × 4 = 36
6 × 5 = 30	7 × 5 = 35	8 × 5 = 40	9 × 5 = 45
6 × 6 = 36	7 × 6 = 42	8 × 6 = 48	9 × 6 = 54
6 × 7 = 42	7 × 7 = 49	8 × 7 = 56	9 × 7 = 63
6 × 8 = 48	7 × 8 = 56	8 × 8 = 64	9 × 8 = 72
6 × 9 = 54	7 × 9 = 63	8 × 9 = 72	9 × 9 = 81
6 × 10 = 60	7 × 10 = 70	8 × 10 = 80	9 × 10 = 90
6 × 11 = 66	7 × 11 = 77	8 × 11 = 88	9 × 11 = 99
6 × 12 = 72	7 × 12 = 84	8 × 12 = 96	9 × 12 = 108

10 × 1 = 10	11 × 1 = 11	12 × 1 = 12	ROMAN NUMERALS
10 × 2 = 20	11 × 2 = 22	12 × 2 = 24	
10 × 3 = 30	11 × 3 = 33	12 × 3 = 36	
10 × 4 = 40	11 × 4 = 44	12 × 4 = 48	I = 1
10 × 5 = 50	11 × 5 = 55	12 × 5 = 60	V = 5
10 × 6 = 60	11 × 6 = 66	12 × 6 = 72	X = 10
10 × 7 = 70	11 × 7 = 77	12 × 7 = 84	L = 50
10 × 8 = 80	11 × 8 = 88	12 × 8 = 96	C = 100
10 × 9 = 90	11 × 9 = 99	12 × 9 = 108	D = 500
10 × 10 = 100	11 × 10 = 110	12 × 10 = 120	M = 1000
10 × 11 = 110	11 × 11 = 121	12 × 11 = 132	$\overline{M}$ = 1,000,000
10 × 12 = 120	11 × 12 = 132	12 × 12 = 144	